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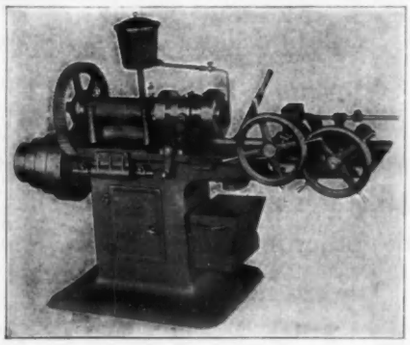
AMERICAN MACHINIST

A PRACTICAL JOURNAL OF MACHINE CONSTRUCTION.
ISSUED WEEKLY BY THE AMERICAN MACHINIST PRESS,
Vol. 22. 218 WILLIAM STREET, NEW YORK. No. 42.

Contents and Index to Advertisers, Page 12



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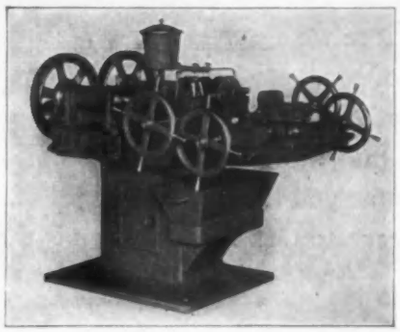

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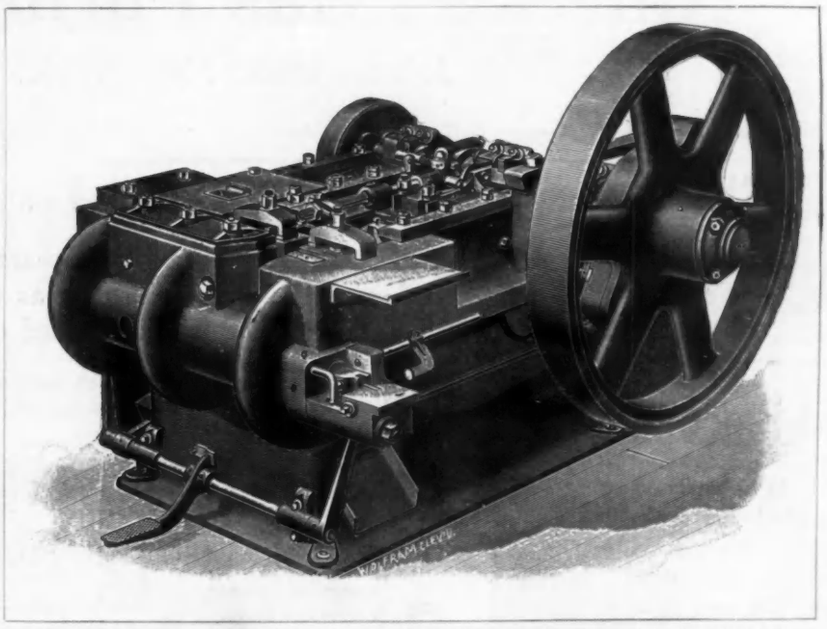
Write us for anything you may want in the **Bolt and Nut Machinery Line.**



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Acme 1½ inch Bolt and Rivet Heading, Upsetting and Forging Machine. Weight, 16,000 lbs.

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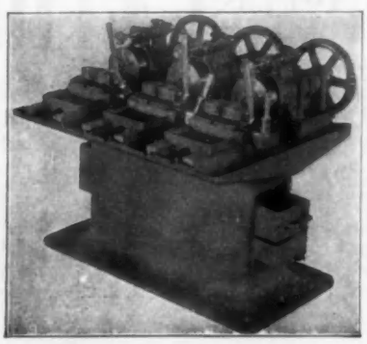

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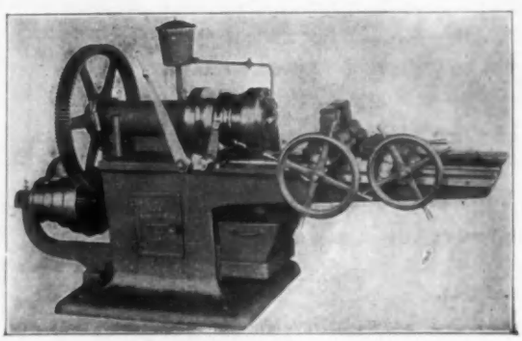

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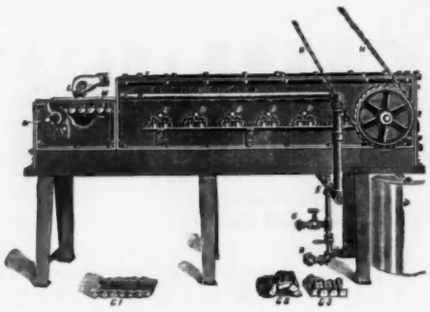

"Willful Waste Makes Woeful Want."

It's willful waste to do tempering, annealing or case hardening with the old, back-number coal or coke furnaces—waste of time and fuel, and often of costly materials.

It may not make woeful want in your particular case, but it will make a difference that will be felt in the biggest and best of shops, as compared with the present-day Gas Furnace methods of doing such work—a difference in profits and in quality of output.

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Write for Catalog of **Fuel Gas Plants.**

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23 John Street, New York.

Chas. Churchill & Co., London, Birmingham, Manchester and Glasgow. H. Glaenzer & Perreaud, Paris. Schuchardt & Schütte, Berlin, Cologne, Vienna, St. Petersburg.

SEND FOR CATALOG.

WORCESTER MACHINE SCREW CO.

MANUFACTURERS OF
Set, Cap and Machine Screws, Studs, &c.

The Little Leaks

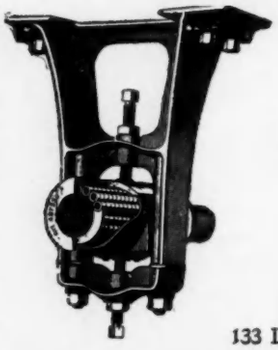
that are so small as to be hardly noticeable, are important and should never be lost sight of. For instance, there's that little matter of oil that's thrown out on chips, bolts, nuts, etc.—ever think how much money you throw away every year in that way? Aside from being discolored, that oil is practically as good as it ever was, yet it's thrown away. No shop that uses as little as three barrels of oil per year, can afford to be without the means of reclaiming such oil for further use—a Roper Centrifugal Oil Separator. Let us tell you more about it.

American Tool & Machine Co.

MANUFACTURERS OF SUGAR MACHINERY.

Founded 1845.
Incorporated 1864.

Boston, Mass.



"The Power Lost By Friction."

It disappears like snow before the sun, as silently as the dew, and cannot be tasted, touched or smelt.

The Hyatt Book will tell you how to save much of this loss.

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PERFECT ADJUSTMENT.
UNEQUALLED SCOPE.
Price with 6 and 10 inch spindle, $2.50.

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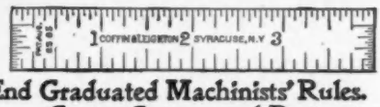


End Graduated Machinists' Rules.
Center Gauges and Protractors.
Send for Catalog.
Coffin & Leighton, Syracuse, N. Y.

FOOT POWER LATHES

FOR THE
ELECTRICIAN,
EXPERIMENTER,
BICYCLE REPAIRING,
GENERAL MACHINE SHOP WORK.

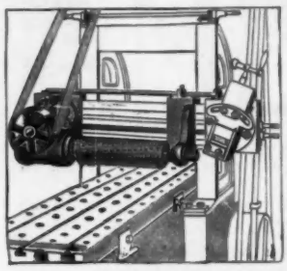
Send for Catalog.

9 in. to 13 in. swing.

W. F. & JNO. BARNES CO., 1995 Ruby Street, Rockford, Ill.

CHAS. CHURCHILL & CO., English Agents, LONDON, E. C.

MILLING MACHINE



combined with any **Iron Planer** swivels from Horizontal to Vertical. Do not plane surfaces that should be milled or mill surfaces that should be planed.

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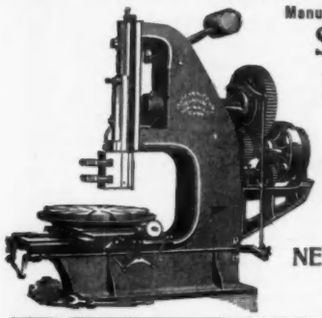
The Adams Company, Dubuque, Ia.

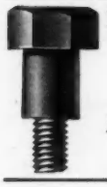
NEW HAVEN MFG. CO.



Manufacturers of

Slotters, Planers, Lathes, Drills, Etc.

NEW HAVEN CONN.



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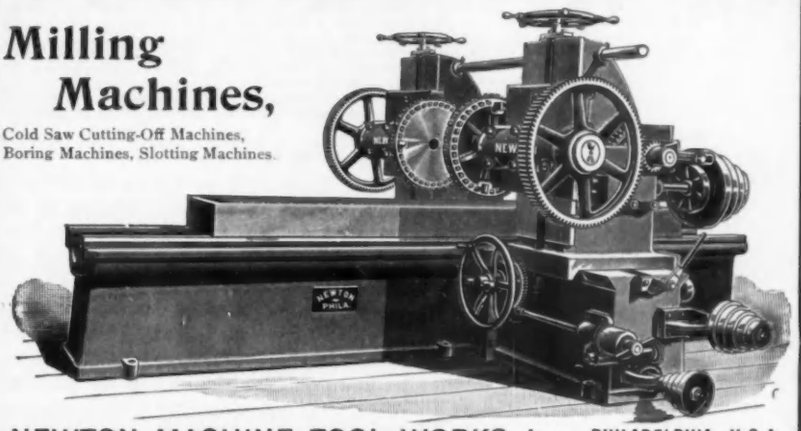
Sheet Metal Stamping.
Hardware Specialties.
SITTMAN & PITT,
STATE STREET AND BOERUM PLACE, BROOKLYN, N. Y.

NEWTON

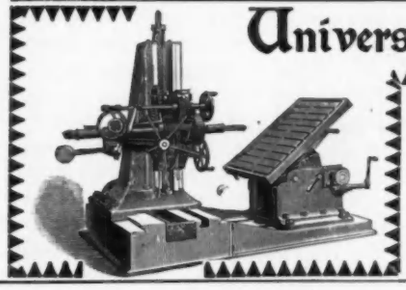
Milling Machines,

Cold Saw Cutting-Off Machines, Boring Machines, Slotting Machines.



NEWTON MACHINE TOOL WORKS, Inc., PHILADELPHIA, U.S.A.

Universal Horizontal Drill.



Five sides of a cube can be drilled at any angle without re-chucking the work.

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U. BAIRD MACHINERY CO.,

523, 525 Water Street,
PITTSBURGH, PA., U. S. A.

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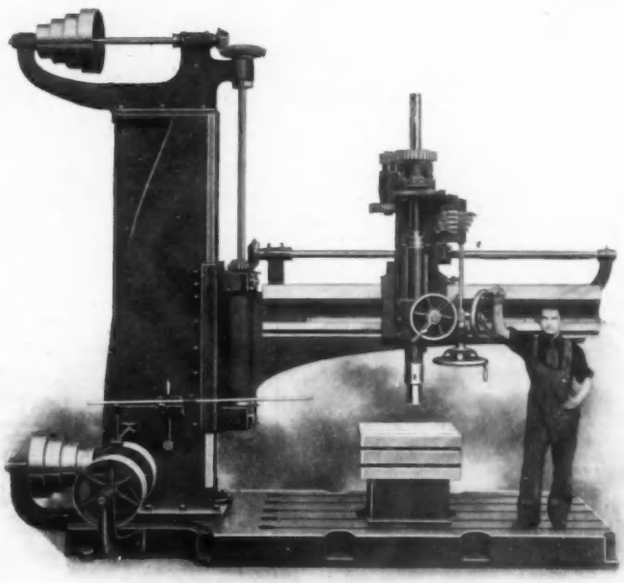
No. 2½ Radial Drill

WE RECENTLY FURNISHED.

Radial Arm, 8 feet long.
Drill to Center of 16 ft. 7 inches.
Height of Machine, 13 feet.
Hole in Spindle Morse Taper No. 6.



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MACHINE TOOLS.

Index to Advertisers.

PAGE

Acme Machinery Co.....1 and 16
Adams Co., The..... 11
Albro-Clem Elevator Co..... 43
Almond, T. R..... 41
American Gas Furnace Co..... 2
American Saw Co..... 10
American Tool & Machine Co..... 2
American Tool Works Co..... 46
Armstrong Bros. Tool Co..... 6
Arthur Co., The..... 8

Backus Water Motor Co..... 54
Baird & Co., Henry Carey..... 41
Baird Machinery Co., U..... 11
Baker Brothers..... 48
Baldwin, Davidson & Wight..... 42
Ball Bearing Co..... 16
Barker & Chard Mach. Tool Co..... 47
Barnes & Co., W. F. & John.....2 and 6
Beaman & Smith..... 43
Becker-Brainard Milling Mach. Co..... 45
Bement, Miles & Co..... 10
Besly & Co., Chas. H..... 56
Bethlehem Foundry & Machine Co..... 5
Bethlehem Steel Co..... 55
Bickford Drill & Tool Co..... 43
Bignall & Keeler Mfg. Co..... 8
Bilgram, Hugo..... 15
Binghamton Machine Tool Works..... 40
Bliss Co., E. W..... 6
Boston Gear Works..... 49
Bradford Mill Co., The..... 53
Bristol Co..... 56
Brown Hoisting & Conveying Mach. Co... 55
Brown & Sharpe Mfg. Co..... 56
Brown & Co., R. H..... 9
Buffalo Forge Co..... 56
Builders Iron Foundry..... 4
Bullard Machine Tool Co..... 5
Bullock Electric Mfg. Co.....43 and 47
Burt Mfg. Co..... 39

Caldwell Co., W. E..... 54
Carborundum Co., The..... 41
Card Mfg. Co., S. W..... 7
Case Mfg. Co..... 5
C & C Electric Co..... 51
Chadwick & Co., G. B..... 6
Chandler & Taylor Co..... 54
Chisholm & Moore Mfg. Co..... 49
Cincinnati Mach. Tool Co..... 48
Cincinnati Milling Machine Co..... 53
Cincinnati Radial Drill Co..... 55
Cincinnati Shaper Co..... 16
Clark, Jr., & Co., Jas. R..... 45
Cleveland Ball & Screw Co..... 47
Cleveland Gear Works..... 39
Cleveland Twist Drill Co..... 56
Clough, R. M.....45 and 48
Coffin & Leighton..... 2
Columbus Machine Co..... 54
Cook Co., Asa S..... 9
Cornell Machine Co..... 54
Crescent Steel Co..... 7
Crosby Steam Gage & Valve Co..... 7
Cumberland Iron & Steel Shafting Co.... 7
Curtis & Co., Mfg. Co..... 15
Curtis & Curtis..... 4
Cushman Chuck Co..... 9

Dallett & Co., Thomas H..... 55
Danielson Machine & Tool Co..... 14
Davis Machine Co., W. P..... 16
Dayton Globe Iron Works Co..... 54
Detrick & Harvey Machine Co..... 11
Detroit Lubricator Co..... 54
Dixon Crucible Co., Joseph..... 49
Doan & Co., J. B..... 14
Draper Machine Tool Co..... 51
Dreses, Mueller & Co..... 44
Dwight Slate Machine Co..... 48
Dyson & Sons, Jos..... 6

Eames Co., G. T..... 7
Eastern Machinery Co..... 4
Eddy Electric Mfg. Co..... 48
Electrical Engineer Institute..... 40
Errington, F. A..... 9

Falkenau, A..... 40
Faneuil Watch Tool Co..... 56
Fellows Gear Shaper Co..... 48
Ferracute Machine Co..... 54
Ferris, Walter..... 43
Fifield Tool Co..... 56
Flather & Co..... 16
Foos Gas Engine Co..... 54
Forsaith Machine Co., S. C..... 14
Fosdick & Holloway Mach. Tool Co..... 42
Frick Co..... 54

Garvin Machine Co., The..... 3
General Electric Co., The..... 55
Geometric Drill Co..... 47
Gisholt Machine Co..... 3
Gleason Tool Co..... 56
Goodyear, S. W..... 4
Gould & Eberhardt..... 16
Grant Gear Works..... 16
Grant Mfg. Co..... 52
Gray Co., G. A..... 16

PAGE

Hamilton Machine Tool Co..... 48
Hammacher, Schlemmer & Co..... 41
Hampden Corundum Wheel Co..... 4
Hardinge Bros..... 9
Hart Bros. Machine Co..... 14
Hart Mfg. Co..... 52
Hartford Steam Boiler Insp. & Ins. Co... 40
Heald & Son, L. S..... 13
Henderer's Sons, A. L..... 15
Hendey Mach. Co..... 13
Henley & Co., N. W..... 40
Hoggson & Pettis Mfg. Co..... 9
Horsburgh & Scott..... 56
Horton & Son Co., E..... 9
Howard Iron Works..... 55
Hunt Co., C. W..... 45
Hurlbut-Rogers Machine Co..... 9
Hyatt Roller Bearing Co..... 2

Ingersoll-Sergeant Drill Co..... 49
International Correspondence Schools.... 49

Jenkins Brothers..... 41
Jones & Lamson Machine Co..... 16

Kempsmith Machine Tool Co..... 4
Keuffel & Esser Co..... 8

Landis Tool Co..... 6
Le Blond Machine Tool Co., R. K..... 56
Le Count, Wm. G..... 9
Leighton & Wisner..... 42
Leland & Faulconer Mfg. Co..... 4
Lodge & Shipley Machine Tool Co..... 50
Long & Allstatter Co..... 13
Lowe & Higson..... 42
Lucas & Gliem..... 16

McCabe, J. J.....14 and 49
Main Belting Co..... 55
Marshall & Huschart Machinery Co..... 14
Mergenthaler & Co., Ott..... 44
Mietz & Weiss..... 54
Morse Twist Drill & Mach. Co..... 15
Morse, Williams & Co..... 8
Morton Mfg. Co..... 55
Moseley Lathe Co..... 16
Mossberg & Granville Mfg. Co..... 42

National Elastic Nut Co..... 10
Newark Machine Tool Works..... 16
New Era Iron Works..... 54
New Haven Mfg. Co..... 11
New Jersey Machine Works..... 45
New Process Raw Hide Co..... 48
New Process Twist Drill Co..... 6
Newton Machine Tool Works, Inc..... 11
Nicholson File Co..... 41
Nicholson & Co., W. H..... 15
Niles Tool Works Co., Hamilton..... 47
Niles Tool Works Co., New York..... 14
Northern Engineering Works..... 49
Norton Emery Wheel Co..... 49

Oesterlein Machine Co., The..... 16
Oster Mfg. Co..... 47

Pearson Machine Co..... 4
Pierce Engine Co..... 54
Pond Machine Tool Co..... 51
Pond Machine Co., L. W..... 3
Potter & Johnston Co..... 8
Pratt Chuck Co..... 9
Pratt & Whitney Co..... 15
Prentiss Tool & Supply Co..... 14
Putnam Machine Works..... 16

Q & C Co..... 10
Quint, A. D..... 15

Reeves Pulley Co..... 52
Reinecker, J. E..... 52
Reliance Machine & Tool Co..... 54
Rogers Boat, Gage & Drill Works, John.. 3
Rue Mfg. Co..... 54

Safety Emery Wheel Co..... 45
Saunders' Sons, D..... 7
Sawyer Tool Co..... 2
Schumacher & Boye..... 52
Schwerdtle & Siebert..... 14
Sebastian Lathe Co..... 4
Sellers & Co., Inc., William..... 16
Seneca Falls Mfg. Co..... 4
Shultz Belting Co..... 16
Sibley & Ware..... 49
Siemens & Halske Electric Co..... 8
Silk, Anderson Co..... 48
Sittman & Pitt..... 11
Skinner Chuck Co..... 9
Slocomb & Co., J. T..... 42
Smith & Mills..... 49
Snyder, J. E..... 8
Spencer Auto. Mach. Screw Co..... 7
Springfield Foundry Co..... 55
Springfield Gas Engine Co..... 54
Springfield Machine Tool Co..... 53
Springfield Separator Co..... 15
Standard Tool Co..... 45

PAGE

Standard Welding Co..... 42
Starrett Co., L. S..... 10
Steel Ball Co..... 7
Stover Novelty Works..... 4
Stuart's Foundry & Machine Works, R. J. 56

Tabor Mfg. Co..... 54
Tight Joint Co..... 55
Toomey, Frank..... 14
Trump Brothers' Machine Co..... 9
Turner, Vaughn & Taylor Co..... 45

Waltham Watch Tool Co..... 52
Warner & Swasey..... 56
Watson-Stillman Co., The..... 5
Weber Gas & Gasoline Engine Co..... 54
Webster Mfg. Co..... 54
Wells Bros. & Co..... 56
Wesselmann Maschinen Gesellschaft..... 3
Western Mfg. Co..... 46
Westcott Chuck Co..... 9
Westmacott, J. M..... 8
Whitcomb Mfg. Co..... 46
Whitney, Baxter D..... 42
Whitney Mfg. Co..... 51
Whiton Machine Co., D. E..... 9
Wiley & Russell Mfg. Co..... 7
Wiley & Sons, John..... 41
Williams & Co., J. H..... 46
Windsor Machine Co..... 52
Winkley, F. D..... 16
Wood's Sons, T. B..... 15
Woodward & Powell Planer Co..... 41
Woodward & Rogers..... 14
Worcester Machine Screw Co..... 2
Wyke & Co., J..... 7
Wyman & Gordon..... 56

York Co., S. M..... 14
Young Mfg. Co., W. C..... 49

Contents.

PAGE

As to the Conduct of this Journal—Our Descriptions of Shops and New Machines 17
"Liquid Air and Its Promoters"..... 18
Commercial Review 19
The New Work Shops of Ludw. Loewe & Co., in Berlin—IV..... 23
An English Endorsement of American Industrial Methods..... 26
The Gasoline Engine in Boats—II. By Herbert L. Towle..... 29
"The Theory and Practice of Getting Jobs" 31
Rotary Planer on Turntable Base..... 32
Letters from Practical Men: Logical System of Wages. By "Old Mechanic"...Increase-Twist Reamers. By W. A. Warman....Taps and Tap Wrenches. By G. J. M...Two Pattern Shops. By Wm. Newton.. ..Punching and Drawing Ferrules. By Riggs....Another Boring Tool. By A. F. Horton....Boring the Breech of a Gun. By H. S. Brown. ....Drawing Flanged Cups. By Die Maker....That Broken Crank Shaft. By E. C. Jarvis....Draftsman's Curves. By E. R. Plaisted..32-37
Questions and Answers..... 37
The French Machine Tool Trade..... 37
For Resharpening Files..... 38
Technical Publications 38
Personal 39

AMERICAN MACHINIST

A PRACTICAL JOURNAL OF MACHINE CONSTRUCTION

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As to the Conduct of This Journal —Our Descriptions of Shops and New Machines.

There is one feature of this publication that we find is especially liable to be misunderstood, and that is, our descriptions of new machines and of machine shops, in which the makers' or the owners' names and addresses are given. Notwithstanding our oft-repeated declaration that such articles are published without other consideration than their supposed interest to our readers, we constantly receive evidence that some readers do not understand this. They perceive that such articles are necessarily valuable as advertisements, and are unable to see why we should publish them unless paid for so doing. This is partly the fault of some of our esteemed contemporaries, who do receive compensation for such articles, or, what is the same thing, readily publish any article, "write-up," "reading notice" or puff dictated by an advertiser or one who it is thought may be induced to sign an advertising contract, and entirely without regard to its value as news or as technical matter. As so many other papers are conducted on this principle, it is natural, perhaps, for those who do not take time to look very deeply into these matters to conclude that we do it also; and one of the most difficult things connected with the management of this business is, to make aggrieved manufacturers understand that no advertisements are published in the "American Machinist" except those that are paid for at regular rates and appear in the regular advertising columns as advertisements.

If we were to print one-half of the stuff offered by interested parties in the shape of ready-made "write-ups" with engravings all ready, and the puffs of various kinds that we receive, we could easily fill our paper with them, could dispense with our expensive corps of technically trained editors, cease paying for contributions and for engravings, get out a very cheap paper and—quickly descend to the level of a cheap-John journalistic prostitute.

One of the interesting problems we have to contemplate, for instance, is found in the man who freely acknowledges our unique stand in these matters, declares the paper to be head and shoulders above the crowd of trade papers that pursue the opposite and too common course, and yet is angry with us when we decline his particular contribution to our columns, that in our judgment we should not publish.

Such men sometimes conclude that we do for others what we refuse to do for them, and we have especially in mind one concern which makes compressed-air tools and appliances of various kinds. They persistently insisted that we should publish ready-made "write-ups" which they sent us, and which conveyed no technical information whatever. When we asked for the data, drawings, etc., that would enable us to publish real descriptions of their devices they refused to send them. Then when we published descriptions that really described other similar devices they charged us with partiality, and when we finally obtained some drawings and data from a shop whose product they handle—which drawings and data enabled us to publish an article believed by us to be interesting and valuable to our readers, they expressed their opinion to the effect that we were foolish for publishing such stuff. This, of course, is rather an extreme case, resulting from an unusual degree of ignorance and an unusual inability to perceive what this journal stands for, and what it means to those who read it and depend upon it for information regarding the science, art and business of machine construction.

The easiest course for us would be to let outside interested parties decide what we should publish and supply us with the matter and engravings. There have been numerous examples of trade papers conducted on that principle, many of them now defunct, but too many of them still in existence. They are the papers that flood the business offices and congest the waste baskets of manufacturers, and that have little, if any, circulation except this gratuitous circulation obtained from trade directories and the advertising columns of their contemporaries.

It is our belief that the machinery interests of this country deserve to have and need at least one first-class, independently conducted technical journal, devoted to the interests of the business and craft generally. We are spending time and money in the effort to produce such a paper. Everything printed in our reading columns is based upon the judgment of the editors as to what is suitable, interesting or best worth using the space for. And when we decide to publish an article, we ourselves bear the entire expense of such publication. We make the engravings at our own expense, and we pay writers for contributed articles.

The articles about the Loewe Shops, for instance, have been illustrated by engravings which we have made for that purpose. They cost us quite a sum of money; but this and the other expenses attending the publication we cheerfully bear, because we know that nearly all our readers are interested in these shops. Of course, there is no denying that such publication is incidentally a valuable advertisement for the firm that built these shops; but that we could not avoid if we would, nor would we avoid it if we could. We could not ask for nor receive payment for this, nor could we do it in consideration of advertising contracts without stultifying ourselves and utterly destroying our freedom of choice in selecting matter for publication along with our self-respect as well.

This incidental free advertising is part of the reward that the builder of a new machine or of a new shop gets for having done something noteworthy toward the advancement and building up of the art of machine construction which we represent. Instead of expecting compensation for such publication, we are grateful to those who enable us to present new and interesting things to our readers.

"Liquid Air and its Promoters."

Editor American Machinist:

My attention has been called to an article entitled "Liquid Air and Its Promoters," in your issue of October 5, which is calculated to seriously injure this company by the incorrect statements it contains. I therefore request you to do us the justice of printing the following reply:

1. You state we are "loudly advertising" our "stock for sale." This is untrue. Not a single advertisement of our stock has appeared.

2. You state we have "gorgeous offices with full staff of employees." This is untrue; as you might have seen for yourself, had you thought proper to visit us before penning your attack.

3. You state we are "pouring forth floods of pamphlets and prospectuses which make the most absurd claims for liquid air and the most extravagant assertions as to what we are going to do with it." This is untrue. Indeed, you admit its falsity; for your article proceeds to give the "truth" as to liquid air, in words which are a quotation from what I myself wrote for the Boston *Evening Transcript* of July 15, 1899—a paper that forms the main part of a little pamphlet we issue.

4. I do not suppose you have *wilfully* libelled the American Liquid Air Company; but I have a right to complain of your not having taken the trouble to distinguish our case from that of the two Boston companies you name. In the liquid-air industry, as in all others, there are companies and companies; some being characterized by wild misrepresentations and preposterous claims based upon either culpable ignorance or deliberate fraud, while others are just as respectable, sober and business-like as the American Machinist Press itself. That the American Liquid Air Company belongs to the latter class is clearly evidenced by the passages you have quoted from our pamphlet, which you speak of as being "one of the best statements we have yet seen of the actual possibilities in the use of liquid air, either for refrigeration or for the development of power." This pamphlet is rightfully entitled "The Truth About Liquid Air," and will be supplied, free of charge, to any of your readers who may care to write for the same to the American Liquid Air Company, 1 Broadway, New York City.

STEPHEN H. EMMENS,
President of the American Liquid Air Company.

[We have in our possession four pamphlets issued by the American Liquid Air Company, copies of which anyone may obtain, as did a representative of this paper, by simply asking for them. If these pamphlets or circulars are not advertisements, and if the distribution of them is not advertising, then we have to unlearn the meanings of the words. As to the loudness of the advertising, our readers will be able to judge after perusing some extracts from one of the circulars referred to. The following is the beginning of the "Prospectus" of the company:

"For the last twenty years the use of compressed air has been steadily growing. It is a colossal success. The companies and firms engaged in the business are making large profits. Ice and refrigeration and cold storage are equally successful. If, then, any scientific discovery has been made by means of which a company can acquire a practical monopoly of compressed air, ice and appliances for cold storage and transportation, it is clear that vast gains will result. LIQUID AIR *is a discovery of this character.*"

The capitals and italics of the last sentence are in the original. Following the above is a remarkably clear and excellent short statement of what liquid air is, of the conditions under which it is produced, and of the phenomena connected with its liquid state, but in the midst of it we are informed that "by means of liquid air human industry has suddenly become endowed with what is virtually a new mechanical power, greater in concentrated strength than any hitherto employed, and capable of storage without loss and of transmission with a less reduction of efficiency than is experienced by any other form of energy." Farther along in the same prospectus occurs the following: "In liquid air a power has been placed at the service of mankind which will inevitably take the place of ordinary compressed air; will supersede steam and electricity in many applications; will largely replace ice; will prove an advantageous substitute for dynamite, and will open a vast field of chemical work hitherto untouched. The matter is no longer theoretical. In Europe liquid air has for some time past been successfully made and employed in large quantities for various industrial purposes, and its use is rapidly extending." We, unfortunately, are not otherwise informed as to this extensive and extending use of liquid air in Europe. The prospectus then gets right down to business:

"The American Liquid Air Company is formed for developing this new substance and this new power throughout the United States. It controls what is known as the Ala system of manufacturing and employing liquid air; a system of which a noted authority has recently written (in the "New Era" for August, 1899) as follows: 'The efficiency of the Ala system is reckoned by experts as being necessarily in advance of any that can possibly be attained by the small orifice or "throttle-valve" plan. The Ala device, indeed, is so well thought of that the American Liquid Air Company has already received an order for one hundred sets of apparatus of laboratory size for Europe; a fact that once more proves the expansible power of American industry and invention when brought into competition with the outside world.'"

The author of the above quoted remarks, which do service in three of the four pamphlets before us, is the editor himself of the "New Era," Mr. Chandos Fulton, who is not recognized as a "noted authority," and certainly would himself be the last to lay claim to being any such thing. The statement as to the order from Europe for one hundred sets of apparatus was furnished him by the company itself. As the company has as yet made no exhibition of any apparatus, the placing of such an order is an exhibition of child-like faith not often found in business circles. The entire paragraph above contains all that the company has to say in its prospectus as to the business and property which its stock will represent.

"The company is incorporated under the laws of the State of South Dakota, with an authorized capital of $10,000,000, divided into 100,000 shares of $100 each.

"It is not intended at first to issue more than 10,000 shares, which, it is considered, will give the company an ample working capital. The remaining $9,000,000 will remain in the company's treasury until such time as the development of the business may necessitate the creation of large iron-works and a vast central manufacturing establishment for the construction and supply of air compressors, air liquefiers, pneumatic tools, refrigerating appliances, air motors, motor vehicles and a multitude of other articles connected with the industry.

"The business in detail throughout the country will be conducted by sub-companies operating in specified districts under licenses from the American Liquid Air Company. These sub-companies are now in course of formation, and the sums in cash and stock agreed to be paid by them for the licenses constitute a large and growing profit-fund for the benefit of the stockholders in the parent company in addition to the enormous manufacturing and supply orders thereby ensured.

"Whatever net profits are earned will, after carrying a proper amount to reserve, be distributed half-yearly in January and July of each year. *The first dividend will be declared in January, 1900.*"

The italics of the last sentence are ours, and whatever may fairly be said of the company's office, it is apparent that its prospectus is sufficiently gorgeous. Dr. Emmens surely will not ask us to say that the company has *not* a full staff of employees. The fact that we quoted with our best approval certain portions of one of the pamphlets in our possession does not warrant the assumption that we as heartily endorsed the rest, or that we thereby guaranteed the status of the company, as Dr. Emmens seems to think should follow.

We think it not impossible, and we certainly hope, that the American Liquid Air Company in its "Ala" system has something of value, but we have as yet no satisfactory evidence of it, and we consider it our duty to say so.—Ed.]

Commercial Review.

NEW YORK, SATURDAY EVENING,
October 14, 1899.

SMALL TOOLS AND SUPPLIES.

The number and character of those reports received from manufacturers' agents and dealers which are unqualifiedly bullish in tone seem too great to render it safe to say that a reaction in the market has begun. There exists, however, a current of bearish sentiment worthy to be considered. Some opinion that has been gathered in this connection is here presented.

Manufacturers of supplies are now generally getting in better shape for making deliveries than they were, partly because they have brought their facilities into condition for an increased output and partly because they have worked off the rush of orders that overwhelmed them at an earlier part of the year. It is noticeable that some of them are beginning to look around again somewhat attentively for new orders.

Market authorities are inclined to attribute a good deal of the relative lull they have noticed to the matter of prices. It is true that the ostensible advances taking place have not very lately been so startling as to frighten anybody, but it appears that now consumers are beginning to feel more keenly the advances nominally made some time ago. When manufacturers put up figures many dealers had outstanding contracts upon which they could obtain goods at the old low rates, and while these remained in force the middlemen were often disposed to share the benefit of them with their customers, but upon the expiration of their contracts they are compelled to stiffen up the figures of ultimate distribution. An illustration of such a contract is one which was made by a supply house in town for twist drills a year ago, and which remained in force up to the first of the present month. In the meantime prices of twist drills have gone up over 20 per cent., and when the dealer has to pay present day rates he must necessarily come down rather hard on the consumer. Dependence upon this theory for an explanation must not, however, be pushed too far, since it is only the more fortunate dealers who have had these outstanding contracts at old figures. The price raises were too hasty to allow time for general covering of future requirements. A notion is springing up in the market that present figures may react before long, and this may account for a disposition on the part of some to hold off and wait for such reductions as may be made. It is interesting to note, moreover, that the lull in trade referred to has been noticed in a fine tool house in which practically no change of prices has been made this year; indicating that there are agencies at work beyond immediate monetary considerations, or else showing the sympathy which exists between different branches of business.

One of the most noteworthy recent advances in the small tool line is a raise of about 10 per cent. made by leading manufacturers of vises. It is stated that the price had not been advanced previously. The associated American file manufacturers have agreed to make an advance of list prices November 1, which will amount to about 5 per cent. over the present ones. It is rumored that makers of taps, and also those of cotters, expect to increase prices.

It is an old and a fond expectation of emery-wheel men, that in the day when all things are rendered salubrious they will have a unifying organization of some kind. They feel that they need it, particularly because of the demoralization of prices existing in that trade, which even the business revival of 1899 has not overcome. Some manufacturers make a practice of selling wheels on trial. A traveler for a house where a well-known brand are sold, notices in some shops where he calls, four or five boxes of sample wheels standing around unopened. Of course, this makes it unfair to the conservative emery-wheel manufacturer, for many consumers will avail themselves of the opportunity of using sample wheels which eventually, on the ground of some alleged defect, they will avoid paying for, or for which, if they pay at all, they will do so after perhaps a year's delay. Even consumers of presumably high business character have remarked that they do not count upon paying for the emery wheels they use. Such are the conditions of this trade, though of course it does not necessarily follow that a trust is the best remedy for them.

During the summer a meeting was actually held in the city of Philadelphia with a view to effecting a more or less binding union among emery-wheel manufacturers. It is said to have been called by promoters, whom the manufacturers naturally expected to have some definite scheme to propose; but when they got together, the promoters simply asked the manufacturers, "What have you got to suggest?" so the meeting adjourned in dissatisfaction, and, so far as is known, none has since been held.

The Dodge Manufacturing Company has taken a contract to furnish about $12,000 worth of power transmitting machinery for the Eagle and Phenix Mills, Columbus, Ga., one of the largest cotton plants in the South. The power plant there is being overhauled, and it is said that turbine water wheels made by the Holyoke Machine Company will be installed.

AN INCREASING FACTOR IN EXPORT TRADE.

The selling media for American machine tools in Europe have received an interesting addition by an extension of the commercial scope of Markt & Co., Ltd., of this city. That firm have long been export commission merchants of prominence, handling general hardware, bicycles, bicycle sundries, etc. They have also held foreign agencies for certain makes of machine tools, including for several years those of the Lodge & Shipley Machine Tool Company. Now, however, they have decided to adopt a new and aggressive policy with respect to the tool trade. Within the next ninety days they expect to have open, in addition to their other established branch houses in European cities, three stores for the sale of machine tools exclusively. One of these stores has already been opened in Paris, another will be located in Berlin, and a third probably in London or Manchester. These houses will be in charge of men who have made a specialty of the machine tool business and are thoroughly familiar with American machinery. The machinery department of the firm is under the management of Mr. J. J. Mullaney, who, previous to the establishment of his connection with Markt & Co., some two years ago, was president of the Cooke Machinery Company, of this city.

Several new agencies have been acquired by Markt & Co. The machinery manufacturers now represented by them, in several cases exclusively for all Europe, are as follows: Lodge & Shipley Machine Tool Company, Fitchburg Machine Works, Bates Machine Company, Pearson Machine Company, Bradford Mill Company, Oesterlein Machine Company, Ohio Machine Tool Company, American Turret Lathe Works, Grant Machine Tool Works, Sibley & Ware, Mietz & Weiss, etc. Within four or five weeks some $60,000 worth of machinery of the above makes has been ordered by the firm for stock.

Mr. Mullaney was abroad all of this year up to about the first of August, and for three months he had on working exhibition in Paris a wire nail-making machine built in the United States, and it is this line of machinery, among others, that the firm will push vigorously. Mr. Mullaney states that he believes France to have taken the lead in wire nail manufacture during the early stages of that industry, that afterwards the Belgians by their vigorous efforts gained predominance in it on the continent, and that to-day the Germans preponderate. The last make what has been considered abroad as the best machinery for the purpose, and have held the field until now the American machine mentioned is entering the European contest, with good prospects of success. Mr. Mullaney sold a number of these machines for use in France and Copenhagen. The Danish buyers were prevailed upon to attend an exhibition of the machine in Paris, and afterward two of the machines were sent to Copenhagen to demonstrate their capabilities at the seller's risk. After

one of these had been running two days it was making 490 nails per minute, and an order for twenty machines in addition to the two was the result. A German machine noticed in operation at the same time was working at the rate of 160 nails of the same size per minute.

BALTIMORE NOTES.

The entire story of manufacture here is similar to that which is told in the West. Every shop is full to overflowing, and manufacturers confess, with a heart-breaking tremor in their voices, that they have been compelled to turn away work. The business boom seems to have overwhelmed them. They could more successfully cope with it, had they the necessary machinists, but machinists with any pretence to skill are both difficult to obtain and hard to keep. Indeed, if the present conditions continue, the machinist will certainly acquire a tremendous idea of his importance. Manufacturers are taking what they can get, and the strain on the foremen is, I am told, beginning to tell. With 50 per cent. of men to do 100 per cent. of work, the necessity of watchfulness seems to increase inversely as the square, and the superintendents and foremen are wearing the haggard looks of men deprived of their natural sleep. There are shops in Baltimore, Philadelphia and Wilmington which have for months past been run on as long hours as twenty-two a day. The demand for American tools, of which we are all so proud, is making scarecrows of the men, who are working at 180 pounds to the square inch.

Detrick & Harvey Machine Company finds a well-sustained demand for the special tools which it builds, and no slackening of the high pressure at which the shop has been working for some months past is in sight. The large order for 5-inch gun carriages which this firm received is approaching completion, and the huge lathe for Honolulu will shortly be shipped. To cope with the inrush of orders, new machinery has been purchased; and the building especially set apart for erecting has already been invaded by the machine tool. The company reports a steady demand for bolt-threading machinery and for the special machines for boring out car brasses. These have been for some time accepted as standard by the railroads. For the universal drilling machines, the shop is well ordered ahead.

White & Middleton Gas Engine Company is also working at high pressure, and the shops are as full as when we described them in our pages some months ago. In spite of the tremendous output of gas engines in this country, these works feel no dropping off in the demand for their output. Many of the engines built by this concern are exported.

The Guinn Ball Bearing Company is manufacturing complete bearings for all purposes. They report a steady sale of their product, in many cases for shafting, and for machinery of all kinds.

WILMINGTON NOTES.

The shop of the Hilles & Jones Company is full of very heavy work, many of the machines being built for the new yard of the New York Shipbuilding Company. This shop was one of the first to feel the better effect of the good times, although it ran full time through the dull years which so tried men's souls. They do not look for any immediate contraction of the boom, and have a great deal of work ahead.

Betts Machine Company has made several additions to its extensive shops, adding on gradually as the demand has increased, while conservatively casting a vigilant eye up-wind. The well-equipped foundry which this company has is unable to cope with the calls upon it, and much work goes outside. The machine shop has been enlarged and new tools have been put in, together with ample traveling-crane capacity. It is a well-lighted structure, and at night is illuminated throughout from enclosed-arc, long-burning arc lamps. This enables the work to go on after dark without interruption. This company is shipping certain large tools of its make as far West as Seattle, Wash., and is building a number of massive boring mills for railroad work.

The factory of Trump Brothers Machine Company is full of special work. They have just completed a large number of automatic knitting machines, marvels of intricate mechanism, and are shipping away a lot of automatic envelope-making machines. The factory is equipped throughout with modern tools, and is especially adapted for the work it undertakes. Trump Brothers are also selling a large number of their chucks and lathe-center grinders, shipping them to all points of the compass.

A. L. Henderer's Sons are keeping every tool in their establishment up to its full efficiency, by working it all the time. They report business as excellent, and their jacks going out as fast as made.

CHICAGO MACHINERY MARKET.

There is an abundance of inquiries for electrical machinery in the Western markets, and as distinguished from those of a month or two ago, there is an increase in the number of small prospective purchasers and, relatively at least, less business in view from the larger class of buyers.

Malleable iron foundries have lately been equipping their plants electrically. The new foundry of Forster, Waterbury & Co., Chicago, is to be equipped with generators of about 200 horse-power and motors aggregating about 150 horse-power. The Chicago Malleable Casting Company and the Sargent Company have equipped their foundries in the same way. Bouton & Co., of this city, have just arranged to put electrical power in their branch foundry at Baltimore. Printing offices are among the most active buyers, one recently receiving additional equipment being the Woodward & Tiernan plant, St. Louis, Mo. Prices of electrical goods are slowly but steadily advancing, the appreciation being ascribed to the enhanced cost of material. Considerable business is turned away by the busier makers.

The Siemens & Halske Electric Company's business is increasing rapidly under the new management. Several months ago about 250 men were employed. The last pay roll showed 820, and each week the number is increasing. The plant is running twenty-four hours per day and seven days a week. Business is developing in the automobile, lighting, power equipment, appliance, and, in fact, all departments. The company has commenced the erection of a three-story addition, 50x 125 feet, to its meter department.

The Western Electric Company has commenced the erection of two new buildings at its plant, Jefferson and Harrison streets, Chicago, to cost $85,000, and to be used for machine shop and foundry.

Quotations.

NEW YORK, Monday, October 16.

Iron — American Pig, tidewater delivery in 1900:—

Pennsylvania Irons:	
No. 1 X foundry	$23 60 @ $24 00
No. 2 X foundry	22 60 @ 23 00
No. 2 plain	21 25 @ 22 00
Alabama Irons:	
No. 1 foundry	22 75 @ 23 50
No. 2 foundry	21 75 @ 22 50
No. 3 foundry	21 00 @ 21 50
No. 1 soft	22 75 @ 23 25
No. 2 soft	21 75 @ 22 25
Foundry forge	20 50 @ 20 75

The market is very irregular, and some furnaces ask more than the above prices.

Bar Iron — Base sizes — Refined, mill price on dock, 2.20 @ 2.35c.; store price, 2.60c., upward; common from store, 2.50 @ 2.60c.

Tool Steel—Base sizes, Standard quality, 7 @ 8c.; extra grades, 12 @ 14c.; special grades, 16c. and upward.

Machinery Steel—Base sizes—Ordinary brands from store, in small lots, 2.85 @ 3.10c.

Cold Rolled Steel Shafting—Base sizes —From store, in small lots, 4 @ 4.25c.

Copper—While nominally higher prices are still quoted, the actual market has softened to about the following figures: For Lake Superior ingot, 18⅛ @ 18¼c.; electrolytic, 17⅛ @ 17⅜c.; casting copper, 17 @ 17⅜c.

Pig Lead—Carloads, 4.62½ @ 4.65c.; wholesale lots, 4.60c.

Pig Tin—In 5 and 10-ton lots, f. o. b., New York, weak at 32.10 @ 32.25c.

Spelter—Prime Western in carload lots, 5.45 @5.50c.

Antimony—In cask lots or over, Cookson's, 11 @ 11¼c; Hallett's, 9¾ @ 9⅞c.

Lard Oil—Prime city, present make, ice-pressed, 45 @ 47c., in jobbing lots.

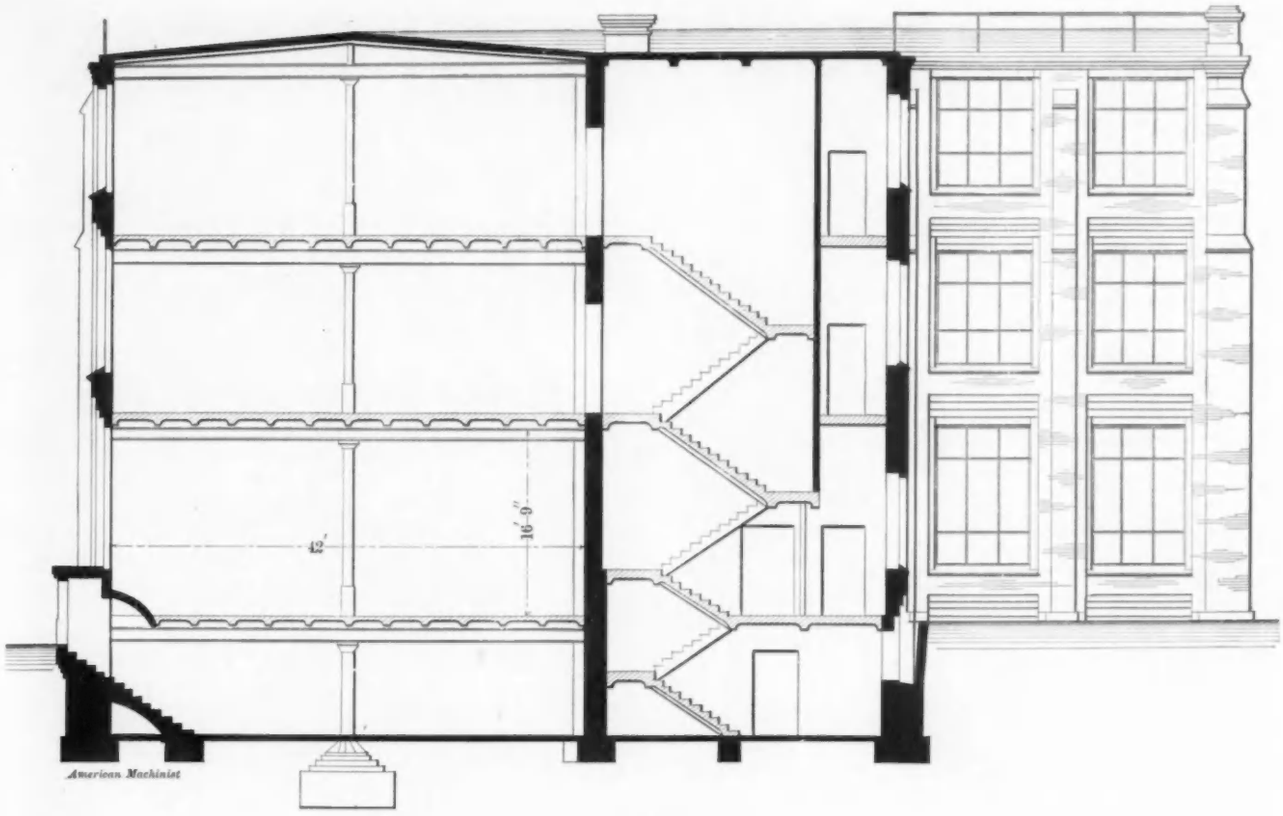


Fig. 23

SECTION OF SMALL TOOL SHOP THROUGH *e f* OF FIG. I, SHOPS OF LUDW. LOEWE & CO., BERLIN.

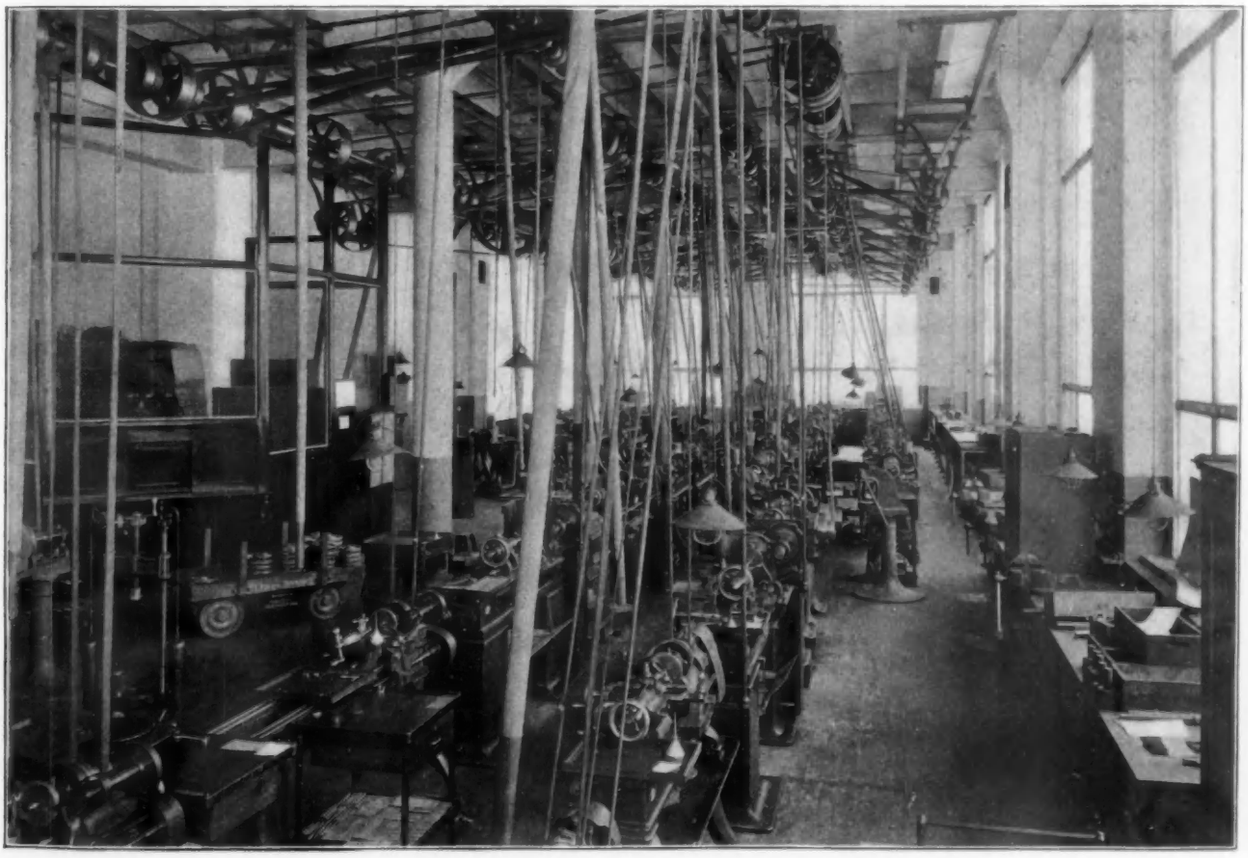


FIG. 24. TURNING DEPARTMENT, GROUND FLOOR OF SMALL TOOL SHOP.

FIG. 25. MILLING DEPARTMENT, GROUND FLOOR OF SMALL TOOL SHOP.

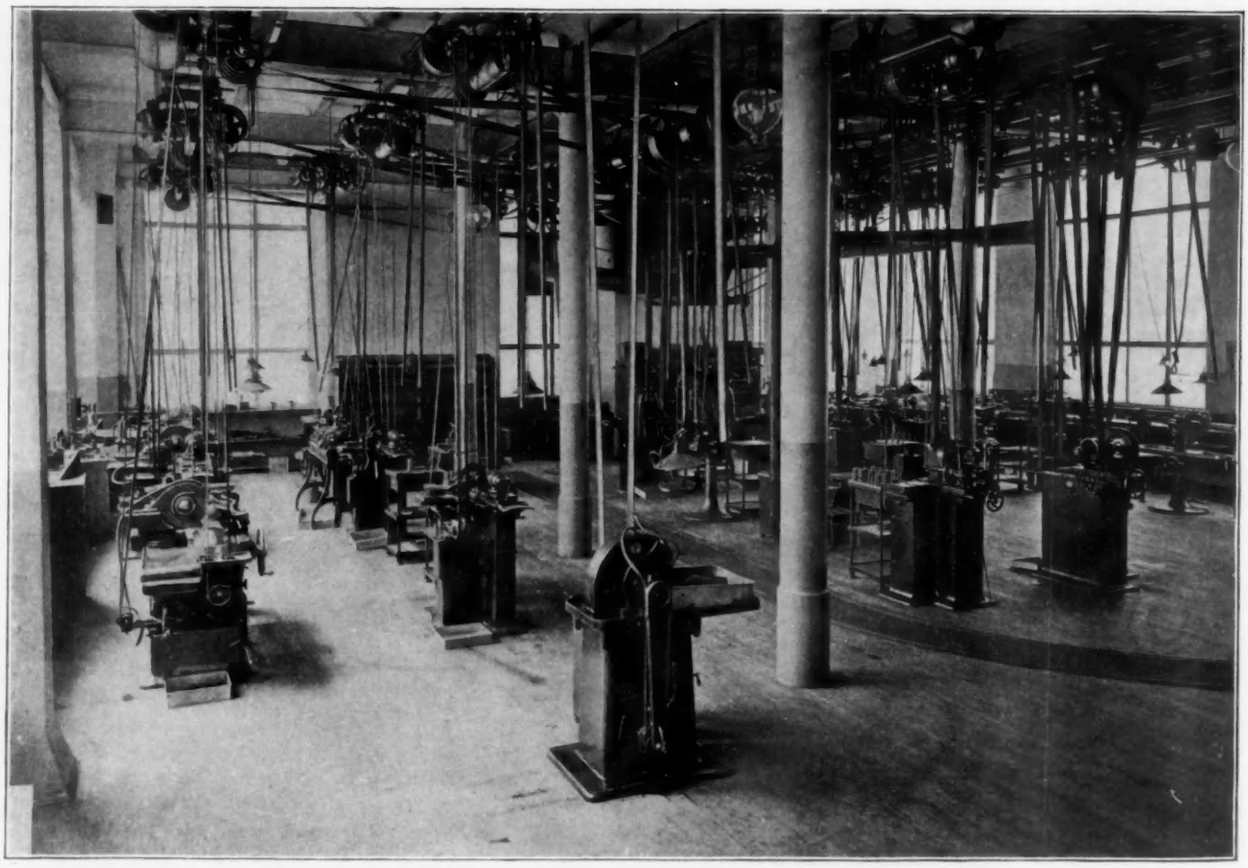


FIG. 26. GRINDING DEPARTMENT, GROUND FLOOR OF SMALL TOOL SHOP.

The New Work Shops of Ludw. Loewe & Co., in Berlin—IV.

THE SMALL-TOOL SHOP.

A large proportion of the business of this company consists of the manufacture of what are classed as small tools, i. e., taps, dies, reamers, arbors, milling cutters, etc., and in fact a complete line of the tools usually used by machinists and in manufacturing establishments, but not belted. This class of work is, of course, more distinctly manufacturing than the work on the larger tools can be, and parts are made in very large numbers at a time. As before remarked, a separate building has been provided for this work, and a section of this building is shown at Fig. 23. Its general style of construction is the same as the winged portion of the machine shop. The turning, milling and grinding departments are separated, and so far as possible the same system of having the work progress constantly in one direction toward the point at which it is finally finished, inspected and stored, is provided for.

The milling department, Fig. 25, is fitted with machines mostly of the company's own make; while the grinding department, which is separated from the others by a partition, and is provided with means for removing dust by suction, is equipped with machines for cylindrical and plane grinding, and also for special work; nearly all these having been supplied by the Brown & Sharpe Manufacturing Company. A view in this department is given at Fig. 26.

The gage department windows face to the north, and there is no obstructing building, so that the best possible light is obtained. In a separate room of this department is a Pratt & Whitney measuring machine, which is the standard reference of the establishment for exact sizes.

THE SMITH SHOP.

The smith shop includes also the store room for steel and iron, the cutting-off and centering department, furnace room for annealing and tempering and the hardening and tempering room. The building is entirely different from the others, as is shown by the section, Fig. 28, and consists of two bays, under one of which there is a basement. The windows are the same as in the other buildings, but more openings are provided in the smith shop and furnace rooms. The building is heated by the forced-blast system, and there are also exhaust fans for carrying off all smoke, gases and dust from the rooms; the apparatus for this as well as the forges being of American make. Wash-rooms and bath-rooms are in the basement.

All work is cut off and centered before it leaves this building, and adjacent to each rack is the machine which is adapted to doing the work on the particular material stored in that rack. The racks are so arranged as to enable the material to stand on end so far as possible, and all racks are accessible from the tracks of the "Hunt" railways.

Fig. 29 shows the storage racks and the cutting-off and centering room; Fig. 30 the furnace room, and Fig. 31 the forge room. The furnaces are made by Brown & Sharpe, the cutting-off and centering machines by Pratt & Whitney, and the power hammers are also of American make.

FOUNDRY.

The foundry, a section of which is given at Fig. 23, is larger than the present needs of the establishment demand, and has been planned with a view to the possibility of making castings for other establishments. It consists, as will be perceived, of four principal bays, which are alike; the crane girders are capable of supporting 15-ton cranes, though at present it is fitted with 5 and 10-ton cranes in the main building and with 3 and 5-ton cranes in the pickling and cleaning departments.

This foundry building is peculiarly an American product, it having been designed and built by the Berlin Iron Bridge Company, of East Berlin, Conn., who sent the prepared material over and a corps of their own erectors to put it up.

The pattern shop and pattern storage buildings require no special mention

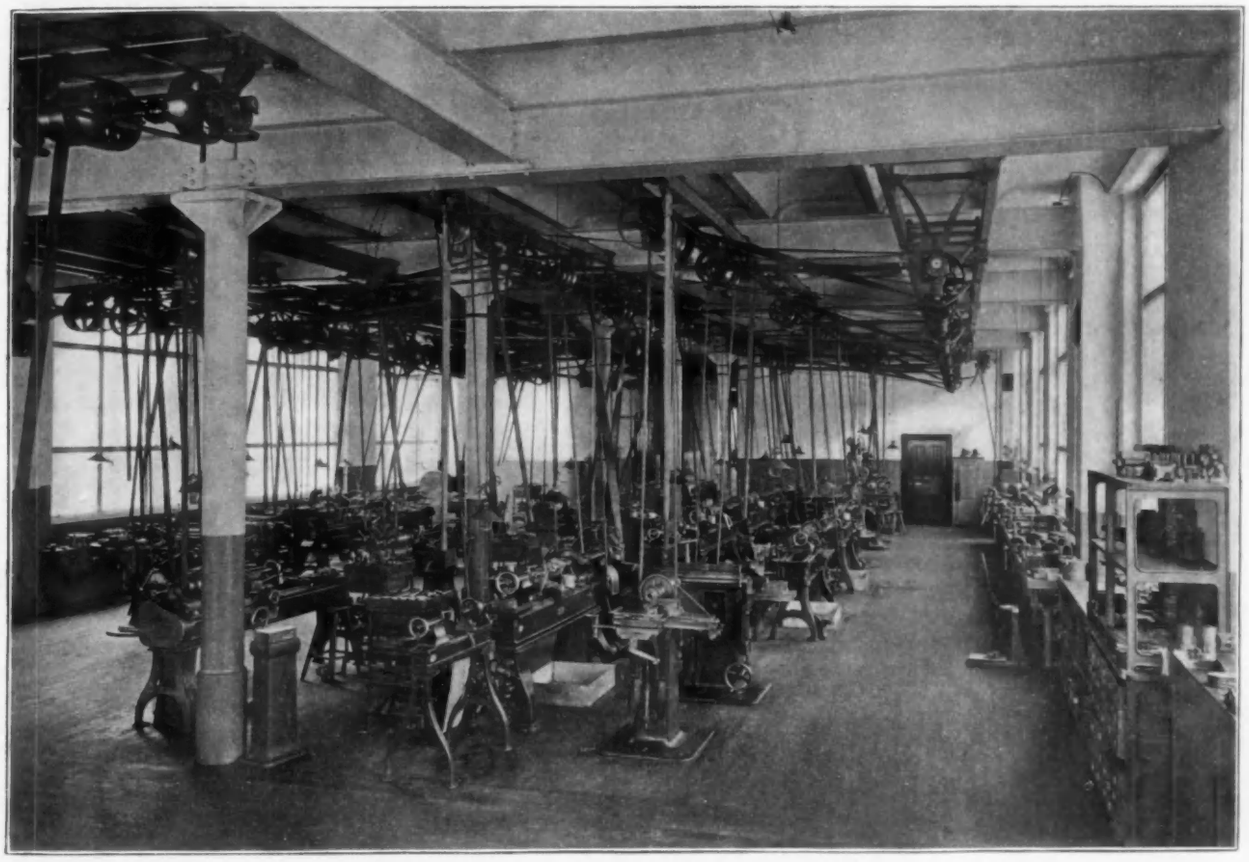


FIG. 27. JIG AND FIXTURE DEPARTMENT, SMALL TOOL SHOP.

other than has been given them, except to say that the construction is the same as the other principal buildings in respect to floors, windows and internal fittings. The pattern shop is equipped with all the latest appliances for doing pattern work, and the pattern storage house is so constructed that it may be readily used for machine work if it ever becomes desirable to do so.

In the laboratory it is proposed to be able to ascertain precisely the quality of all material used, and to this end it is fitted up with complete chemical and physical testing apparatus.

The power station, a view of which is given in Fig. 33, has capacity sufficient to furnish, for the present, power to the neighboring and affiliated establishment of the Union Elektricitäts-Gesellschaft, which in fact uses the major portion of the power developed. The total capacity of the plant for power and light is 1,525 kilowatts; consisting of two units of 300 kilowatts, one of 525 kilowatts and one of 100 kilowatts; all on a 500-volt circuit for power distribution, and one unit of 300 kilowatts at 110 volts for lighting.

that convinced its managers of the necessity for some radical and decisive action. After thorough study of the situation in all its bearings, they concluded to entirely abandon the old shops, situated in a closely built up section of Berlin, go out to the suburbs where ample room was to be obtained, and build the best shops that could be devised, and equip them with the best machine tools and appliances possible to obtain. In doing this American lines have been followed, and hundreds of thousands of dollars' worth of American tools have been installed; in fact, except for the tools

It is true that this shop has been constructed and equipped with the avowed object of enabling it to compete with the products of our American shops in Germany and in neutral markets. There can be little doubt that they will do a large business. They cannot do it all, however, and the extent to which they may make inroads on our trade abroad is of course dependent upon many other things than the possession of good shops, and is yet to be decided. It is our belief that the next ten years are likely to witness such a rapid development of machine shops, so much of throwing away of old equipment in Europe, so much development in Russia and elsewhere, that there will be plenty of work for those who are well prepared to do it; and, in our opinion, the broad view of the general effect of the building and equipment of this shop is the correct one for us to take. Its direct competition will, in our opinion, be far more than balanced by the educative influence it will have—i. e., in teaching those whom, for one reason or another, our manufacturers could not reach, the value of orderly, systematic

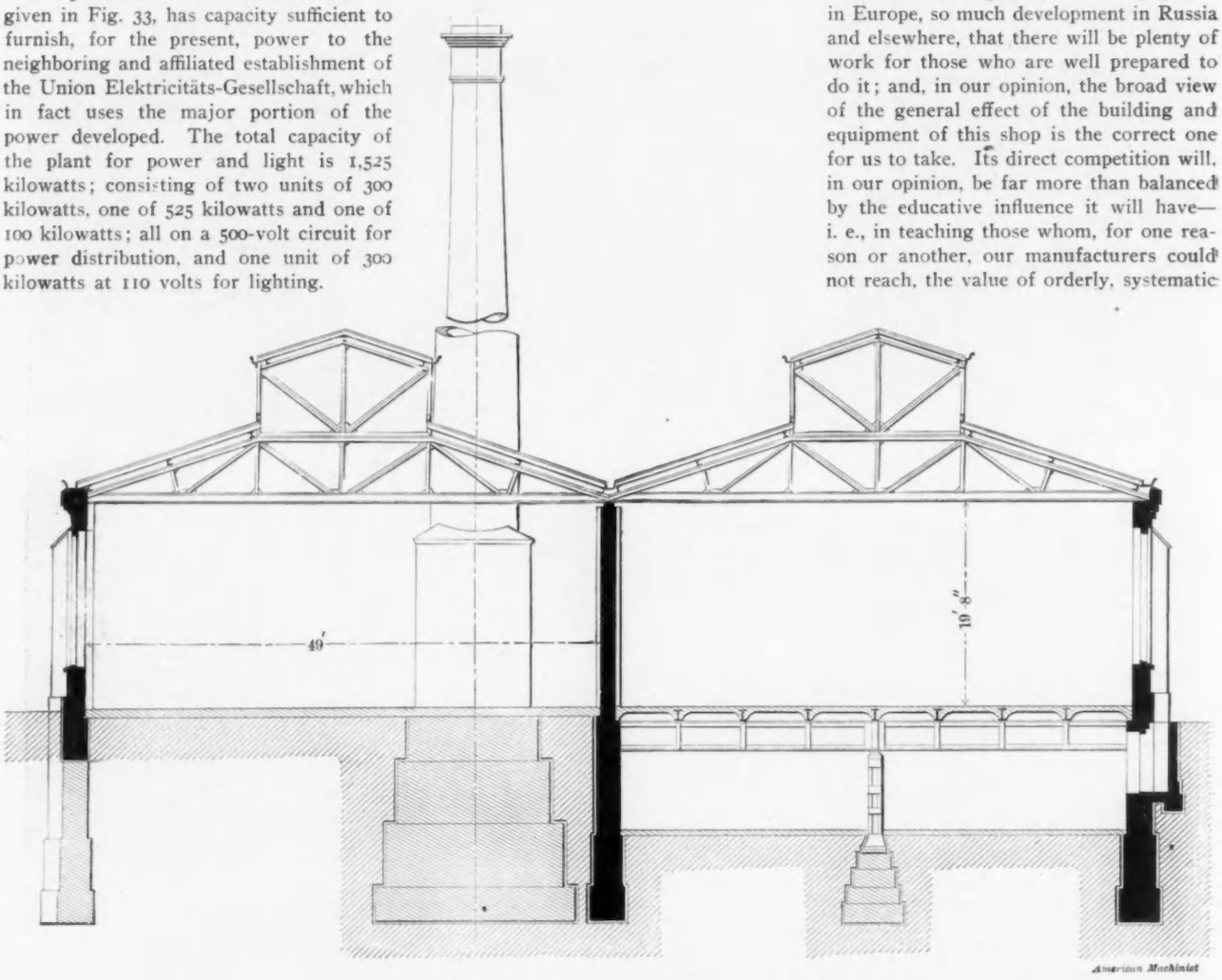


FIG. 28. SECTION OF SMITH SHOP THROUGH *i k* OF FIG. 1.

The total floor space of all the buildings is 412,080 square feet, or nearly 9½ acres.

As we said at the outset, the firm of Ludw. Loewe & Co. had built up a good business based upon the products of a shop that had grown by many successive additions and was by no means up to the requirements of modern mechanical and commercial conditions. Indeed we are informed that it was the strong competition of our American tool builders in the neutral markets of Great Britain, where this firm had built up an important trade, built by the firm itself, the works are equipped with American machinery entirely, and we are convinced that those who are responsible for the choice can give good, sound business reasons for it.

It will be noticed that though the firm's product is not confined to a single machine, as is done in many American shops, yet the lines are so clearly drawn between the different departments, each under a distinct department leadership, and each separately responsible, that it is expected to secure the benefits of single-machine-production.

manufacturing operations carried on by the use of high-grade machinery and tools—such high-grade machinery and tools as are to be obtained, speaking broadly, nowhere else than here in the United States.

The drawings and photographs of course tell much more about these remarkable shops than we can put in print. They are well worth careful study by all who are interested in machine shops or in what is produced in them and the manner of its production.

(*Concluded.*)

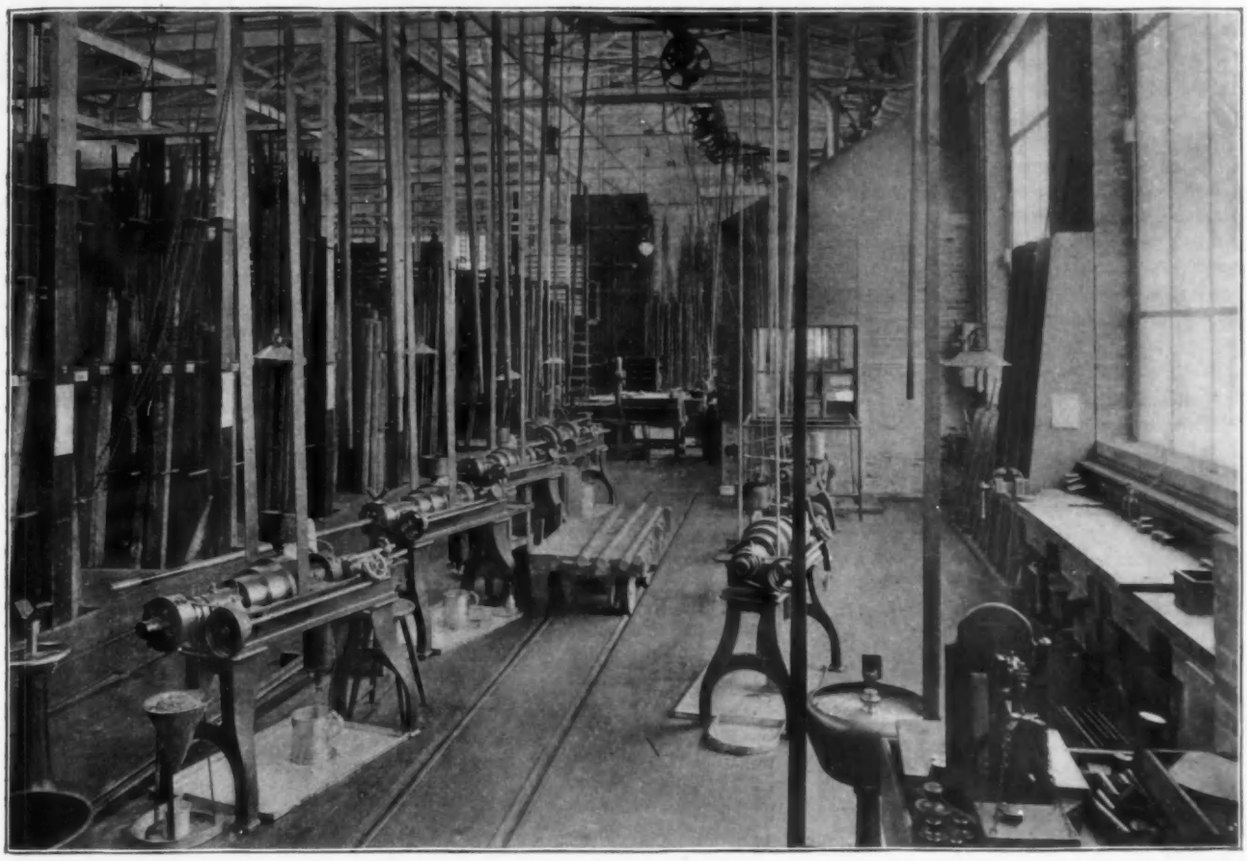


FIG. 29. STEEL STORE ROOM AND CUTTING-OFF DEPARTMENT.

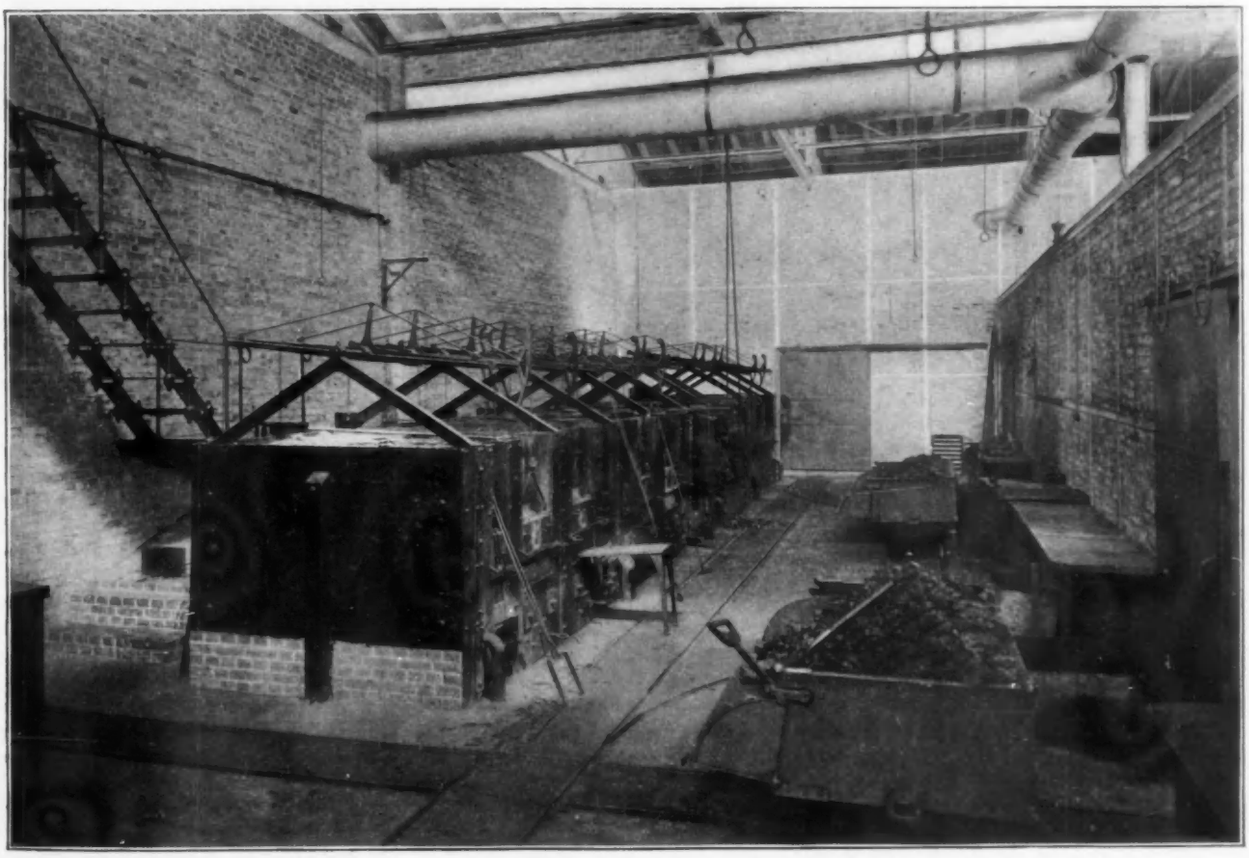


FIG. 30. FURNACE ROOM.

An English Endorsement of American Industrial Methods.

From the second number of "Feilden's Magazine," "militantly British," which occupies a field somewhat similar to that of the "Engineering Magazine," but with the avowed intention of doing what would be called in this country "letting the eagle scream," though obviously without shutting its eyes to what the rest of the world is doing, we extract the following. It is from an article by Mr. Tom Mann, who tells us that he has worked in English shops for a period of sixteen years. He has been a prominent officer of several labor unions, and has been an unsuccessful candidate for Parliament as a labor representative on three occasions. In 1883 he came to this country as a working man to study industrial conditions from the working man's standpoint, and his views will thus be seen to be based on wide observation, and from a side which does not often find its voice in the public press. His conclusions will be seen to be closely in line with those expressed by Mr. Miller, as a result of his tour of observation in European shops in 1897. The italics in these quotations are Mr. Mann's:

"Sixteen years ago I was working as a journeyman engineer in a London shop that had then, and has continued to have to the present time, a considerable number of orders from British and other governments, but whose machinery was of a very antiquated type, and although suggestions were made by workmen to the foremen, no change was made in favor of newer types. For years prior to this I had noticed the steady but sure increase of American tools in English engine and machine shops, and had been impressed with their accuracy and neatness and elegance of design. I kept careful watch of all get-at-able statistics bearing upon the engineering and shipbuilding output of the various countries of the world, and anything that caused Britain to appear to be losing caused me considerable concern, and the continued increase in American milling machines, lathes and small tools had such an effect upon me that I gave up my job in London and made for New York, in order to study the subject on the spot. I was lucky enough to get a place the second day after landing, in a considerable-sized works, that brought me in contact with exactly what I wanted, and my surmises were confirmed on all hands. The first thing to strike me was this—to me a most interesting item: I found that a large proportion of the most responsible positions in American engine and machine tool shops were held by Englishmen or Scotsmen. It mattered not what general opposition there might be to trades unionism as an institution, I saw that American employers—who, by the way, are always experimenting—when they required a few specially reliable skilled men, turned with confidence to members of the Amalgamated Society of Engineers, who had, of course, been through the English workshops. I also observed that although the usual reluctance to granting a general increase of wages or reduction of hours characterized American employers, they most readily paid a generous wage to the men I have referred to, and who, while they had comfortable and interesting situations, were large contributors to the success of their respective firms. Indeed, I formed the opinion then, and I believe it still true, that the love of experimenting which, as far as I could learn, characterized a large percentage of the American employers, and their securing a highly skilled group of men, whom they paid well and treated with confidence, was and is a potent factor in American machine-making progress. I have worked for sixteen years in English engine and machine shops, and in the whole of that time I saw less friendly consultation between employers and employed than I saw in America in sixteen weeks. The English employer seems to fear a loss of dignity if he were to elicit an opinion from anyone of lower rank than the manager or chief draftsman. The American trots out every hour or so, and has no scruple in going

FIG. 31. FORGE ROOM.

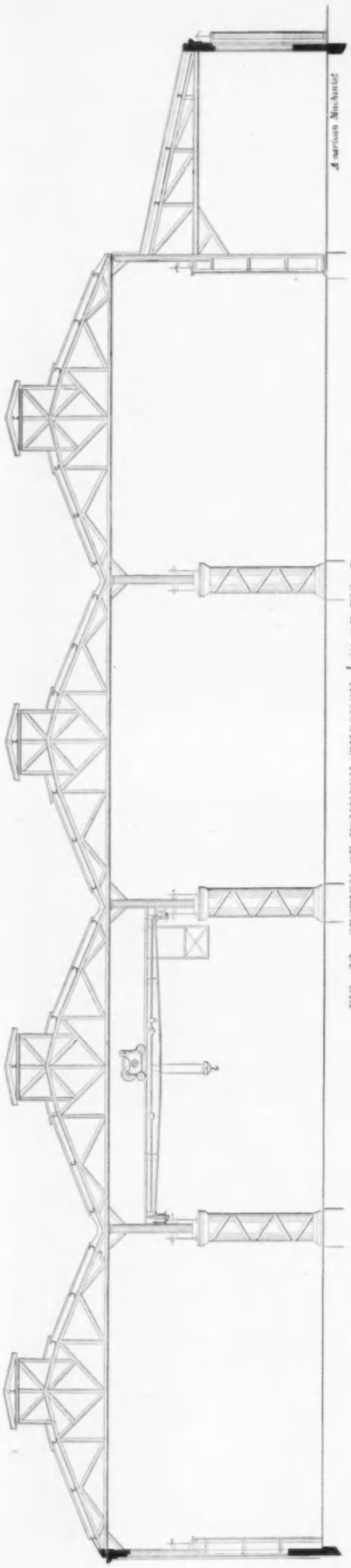


FIG. 32. SECTION OF FOUNDRY THROUGH *l m* OF FIG. 1.

to any workman who may be engaged upon, not the employer's idea only, but that of the employer, manager, draftsman, mechanic and laborer alike—all gathered in the most direct fashion warm from the brains of the men engaged in the business, or indeed from any available source. Nationality aside, I said then and I say now, such behavior deserves to win. It is nonsense to pretend that the British mechanic is inherently incapable, as some appear to think. Englishmen go to the United States, and without five minutes' hesitancy feel at home in the American shops, and begin at once to contribute materially to the making of machinery of greater efficiency than that they helped to build in "the old country." It all hangs on environment; and we have had an abundance of experience to show that if workmen are treated as reasoning beings whose opinions are valued when given, the result is vastly different to that obtained where they are looked upon as machine appendages. I am not of the opinion that America is a paradise for workmen. I know something of the large population of unemployed they so often have, and the terrible stress that prevails over large sections of the populace, in all respects as bad as that we are familiar with in Europe; but, dealing with the position and prospects of American machine-making and its bearing upon the trade in Britain, *the chances for the next decade are distinctly in favor of America*, and that because the customs here in England are so deep-rooted, operating against joint effort of employers and employed to the extent to which it already prevails in America. No one, however, should require to be told that, in spite of everything to the contrary, Great Britain and Ireland are still the world's center for shipbuilding and marine engineering, and no one will doubt the engineering capacity of a nation of 40,000,000 only, and who yet build and engine more than half of the vessels of the whole world. Young America and old Germany have a fine 'long row to hoe' before any material difference can be made in the present proportionate output; there is no doubt at all that British ships and engines are the envy and admiration of every country in the world.

"It is not, however, the marine engine or locomotive builder, or both combined, that is calculated to have so revolutionizing an effect upon the world's industry as the maker of machine tools. The most effective tool, that is *the tool that will turn out the greatest possible product with the least expenditure of energy*—that is what the world is calling for, consciously or otherwise, and it is precisely this that the Americans have been preparing themselves to supply. From Providence, Rhode Island; Fitchburg, Mass., and other American tool-making centers, there is a continual importation of tools and machinery that formerly came only from Manchester, Leeds, or some other portion of Britain.

"In explanation of this, I have referred to the difference of attitude of the American employer towards workmen contrasted with that of his British compeer, to the detriment of the latter. I do not intend to convey the idea that the British mechanic is everything that may be desired, and that all fault lies with employers; it is no doubt the case that in Britain all sections are relatively slow to move as compared with the United States. Statesmen, employers and workers alike are terribly slow at getting out of old ruts. Political power has been used to 'keep the masses in their place,' to emphasize social distinctions, to make it unmistakably clear that between the rich and poor there is and ought to be a great gulf, no measure of a democratic character ever being conceded until it is plainly seen it would be too troublesome to longer withhold. After six centuries of this, it is not very surprising that we find so little coordination for national efficiency.

"English employers have resented rather than encouraged any proposals from workmen so habitually that a man would stand a good chance of losing his situation if he had the temerity to make a suggestion. 'You are not paid for thinking, but working,' has been the reply so often that only an ignoramus could express surprise that helpful suggestions are not more frequently forthcoming. Some years ago I was working as a 'turner' in a London engine shop—almost exclusively on brass work—some American turret lathes with special chucks and chasing bar with 'drag,' instead of the usual 'guide screw,' on which it was quite easy to do *six times the amount of work*, with jobs for which the turret lathes were suited, as could be done on the ordinary lathe. Subsequently I worked in several other shops in London, in each of which there was a considerable amount of work for which the special lathes were adapted, but having lathes of an ancient type—twenty years old some of them—this practically obsolete stuff was allowed to occupy shop room with a proportionate output of work. Similarly the universal milling machines were applied in one or two instances, but the greatest reluctance was shown by employers to clear out, as they might have done, several shaping and slotting machines, in favor of a milling or profile machine. This slowness was not in any degree traceable to opposition from the men, for although it would have meant one man doing as much work as several had been doing before, all that the 'Society' men asked was, that the men employed on the special lathe or machine should receive at least the standard rate.

"I firmly believe that the unwillingness to have changes in the machine shops has been stronger on the employers' side than on the men's, and as a twenty years' mem-

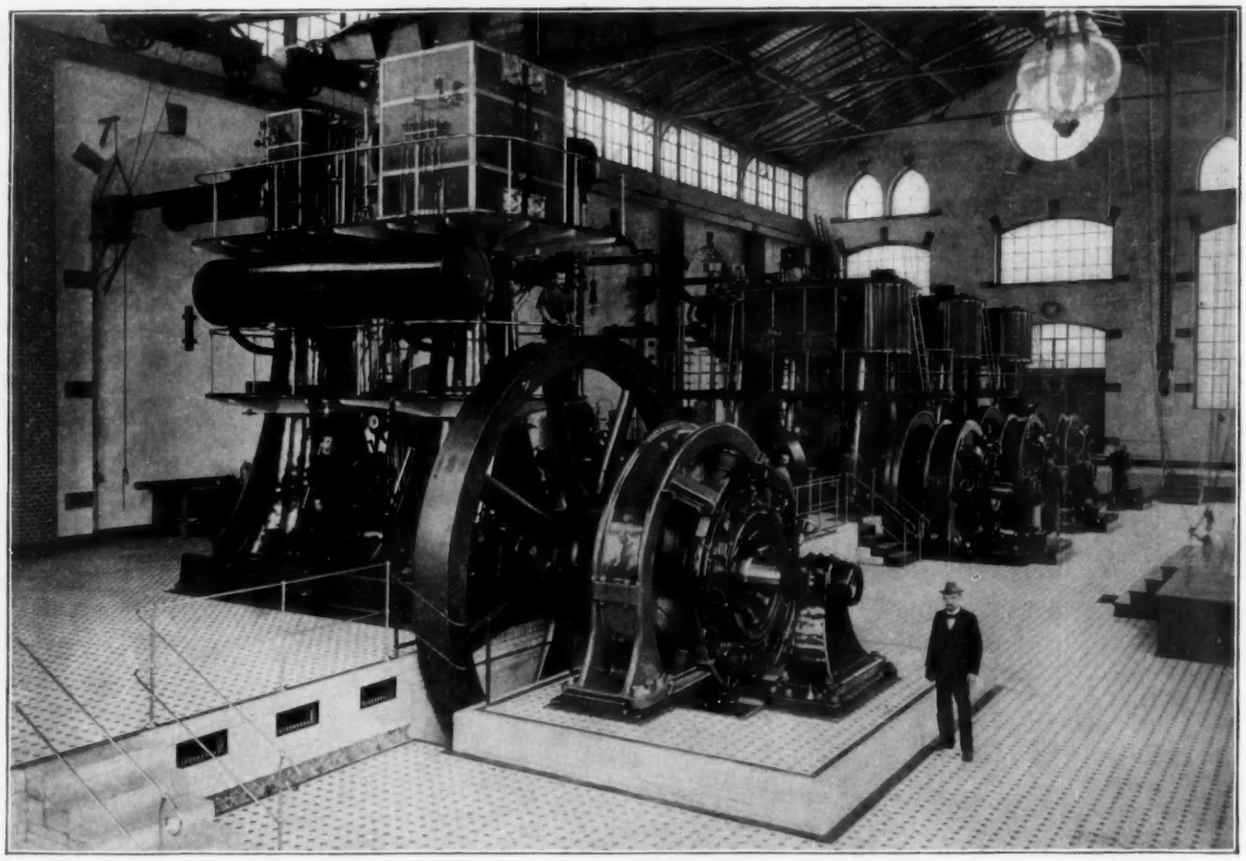


FIG. 33. POWER STATION.

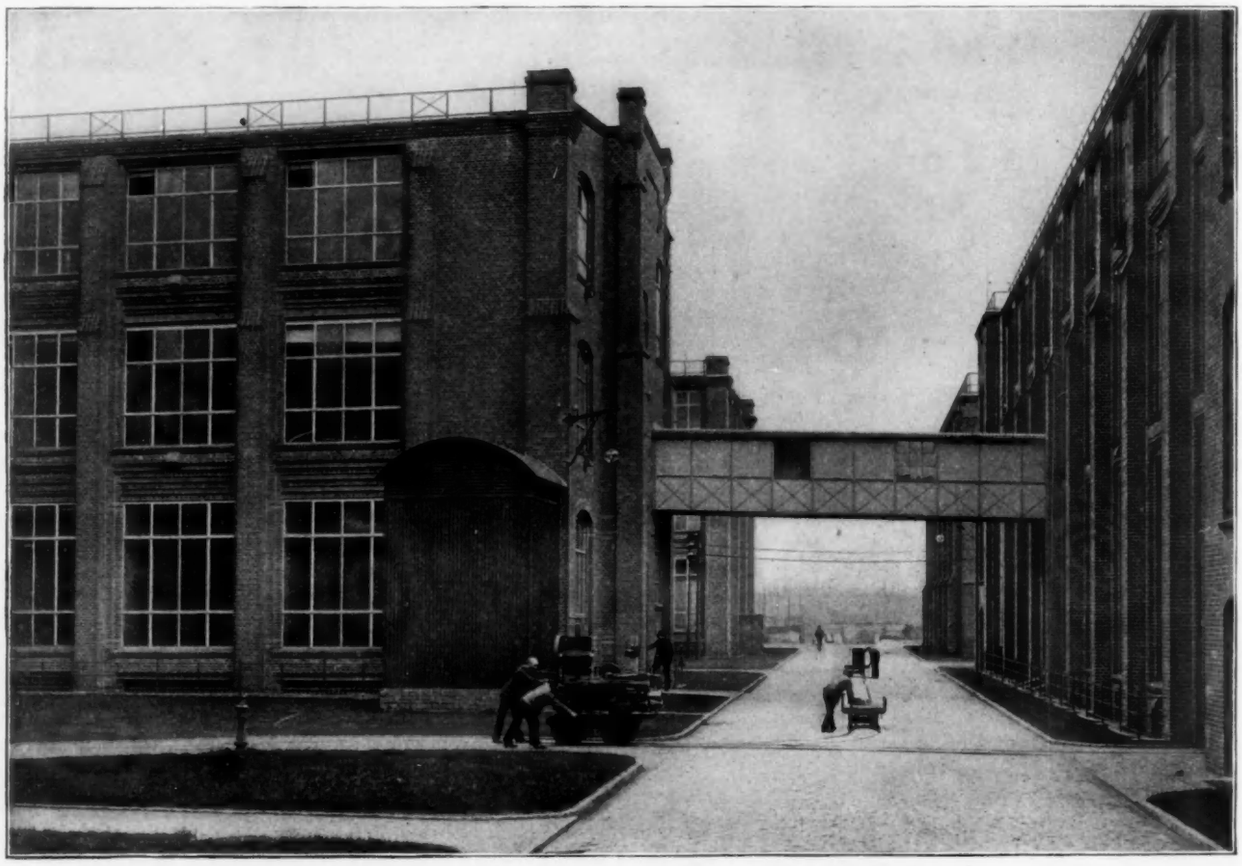


FIG. 34. TRANSPORTING MACHINERY ON LIGHT RAILWAY.

ber of the Amalgamated Society of Engineers, I can positively declare than an overwhelming majority of the members of that organization have no opposition to the introduction of machinery of a more efficient type, providing, of course, that those called upon to manipulate the machinery are fairly dealt by. I am quite sure that this is the case, notwithstanding what was said and done on both sides during the recent dispute.

. . . . .

"The note of alarm that has been sounded consequent upon orders going from Britain to America for locomotives, while it shows the efficiency of the American locomotive builders, does not, even in the smallest degree, prove the decadence of British workmanship.

"Whatever the Americans make a specialty of, they are likely to make the running hot for any competitor, and the opening of vast areas in the United States since the introduction of the locomotive, and which has only been possible by its use, compelled the Americans to specialize on the production of 'locos.' The large 'loco' shops of the States are several times the size of the largest in this country, and on a class of work so systematized as that of 'loco' building, it is not a great tax upon such large establishments to turn out a few extra."

The Gasoline Engine in Boats—II.

BY HERBERT L. TOWLE.

It being thus inadmissible to raise the maximum torque, the only recourse is to increase the speed of rotation or to add more cylinders. We have just seen that the opposite-crank engine is susceptible of considerably higher speed than the single throw; and the practice of a recent designer, in rating all his engines above the smallest to run at 400 revolutions, is a step in the right direction. With carefully lightened pistons and overbalanced cranks, even this could be exceeded. The writer lately saw the announcement of a small English motor of this type, which was claimed to develop 7 brake horsepower at 780 revolutions per minute, and weighing, without reversing gear, 336 pounds. The limitations on increased speed, which it is probable are nearly reached in this latter case, are threefold. If we suppose the opposite-crank engine to be located in the middle of a loop (i. e., nearly amidships), and calculate the moment of its unbalanced upward force with respect to the nodes, we shall find that this is in the neighborhood of four times the moment of its rocking couples. As the latter affect the hull only when the engine is at or near a node, we see that the further aft, or the nearer to the node, the engine can be placed, the less intense will be its tendency to cause harmonic vibrations. Questions of trim, accessibility, and the "pitch" or slope of the shaft are here to be considered; but, having due regard to the design of the hull and to the engine's location therein, we see our first limitation to be in the mechanical vibrations, that these shall not exceed the amount compatible with comfort. Then—and this is essential—the inertia force of the piston and connecting rod, at the top center, must not exceed the force of the compression; otherwise, with the slightest lost motion on crank or wrist-pin, the explosion will cause a destructive knock. Finally, the charge must not be expanded faster than it will burn. This restriction, whose importance is self-evident, will be alluded to again, since it is probable that nothing has done more to retard the development of the high-speed engine than lack of knowledge of the conditions for rapid combustion. I have not mentioned the increased wear and tear of bearings, etc., for that is a problem only of good workmanship and intelligent design, and the reciprocating parts of a gas engine can be made materially lighter than those of a steam engine.

In adding cylinders, the usual step in an Otto cycle engine is from two cylinders to four; and the two forward pistons are commonly made to work on one crank pin, with the other two on another 180 degrees from it. With properly timed cams, this arrangement results in an impulse for every stroke, and as regards vibration, it is equivalent to a large two-cylinder engine with the maximum torque cut in half. It works well in hulls of the size customary for its power, but it is not suited for high speed. A better arrangement would be to put the two middle pistons on one crank, and the end ones opposite to it. This, by eliminating the rocking couples, would admit of largely increased speed; and where the utmost possible speed is required it is perhaps the best arrangement to be had. It leaves only the unbalanced upwark jerk uncared for, and has the incidental advantage of rendering balance weights unnecessary.

For many, and perhaps for most, purposes, however, sufficient power can be obtained from three cylinders, in combination with a high rate of speed; and when such is the case, motives of economy will decide in favor of this construction. Now, it is a fact to which the writer has nowhere seen attention called,* that the sum of the piston inertias of such an engine, with cranks 120 degrees apart, is zero for all speeds and all positions. In other words, with cranks 120 degrees apart, is zero for such an engine has no unbalanced upward jerk, but only a rocking couple. This follows directly from the formula quoted above, by putting w, $w + 120°$, and $w + 240°$, for the crank angle, reducing, and adding the three values of F thus found. The formula as given is approximate, so that the balance is not mathematically perfect; but as the greatest error is only about 1-10 of one per cent., the difference is not worth considering.

Assuming that nodes and loops may exist in a fine-lined launch hull, it results that the best location for a three-cylinder engine is amidships—or, more exactly, a little aft—where its rocking couples will do the least harm. It is doubtful, however, if they could set up serious vibrations wherever the engine was placed, on account of their irregularity, the time-interval between the maximum forces at the ends being alternately one-third and two-thirds of a revolution, so that they tend to neutralize each other's effect. Nevertheless, the middle of the boat is the proper place for the engine, especially if it is to run so fast as to "squat" at the stern; and in this regard the three-cylinder engine has an advantage over the four-cylinder, which should be placed somewhat aft to get its unbalanced jerk over the node.

We thus see that the speed of the three-cylinder engine may be very high—equal, in all likelihood, to that of the four-cylinder; and it may be higher, the closer the centers of the cylinders can be brought together. The cranks should be balanced, of course, else there will be a slewing tendency similar to that of the two-cylinder engine; and in the opinion of the writer this may be extended to include also the upper end of the connecting rod and wrist-pin. The effect of this will be to relieve the vertical rocking a little and substitute corresponding lateral forces.

It being understood that the speed of the engine is limited by the weight of its reciprocating parts, and that higher speed means higher power and higher price, it is evidently worth while to make special effort to lighten these parts. The weights assumed above probably represent the average practice, but the writer has found it possible to reduce that of the piston by over one-third; and by the use of high-carbon steel 20 per cent. or so may be taken from the weight of the other parts. It is well enough in a stationary engine, no doubt, to make the connecting rods of malleable iron, like those mentioned a few weeks ago in the "American Machinist." For that matter, they might doubtless be made of pewter if they were heavy enough; but such materials have no place in a marine engine. If the best is the cheapest anywhere, it is there.

As an example of what is possible by attention to the principles above pointed out let us compare the two-cylinder, 6x7-inch, 7 horse-power engine, running 340

*Prof. Cecil H. Peabody, describing in "Marine Engineering" (February, 1899, page 7) Schlick's method of balancing steam engines, has something not far different. The pistons of steam engines being of diverse sizes and weights, he shows that if the cylinders of a three-crank engine be arranged in order, with the low-pressure cylinder nearest the node, they may be so spaced that the moments of their reciprocating parts, with respect to the node, shall be approximately equal and therefore mutually destructive. He, however, neglects the angularity of the connecting rod, and uses the formula $F = F_0 \cos. W$. The fact pointed out in the text, which takes account of the connecting rod, has peculiar applicability to gas engines, and it certainly deserves to be better known.

H. L. T.

revolutions, with the three-cylinder engine evolved from it. In consideration of the increased weight of the engine and the consequent slightly greater displacement of the hull, it is safe to say that 1 inch can be added to the stroke without relative increase of the torque reaction, and this gives a better proportion for economy. This, for two cylinders, will give 8 horse-power (the speed remaining the same), or 12 horse-power for three cylinders. The reciprocating parts, if lightened to the utmost, will weigh about 21 pounds, of which the piston will take 14 to 15. With the aid of a little overbalancing this may, without sensible error, be taken as 20 pounds. Now, bearing in mind that the three-cylinder engine is to have balanced cranks where the two-cylinder (presumably) had not, that the reciprocating parts are lighter, and that there is no unbalanced upward jerk, we may safely assume an increase of one-third of its speed. This makes 453 revolutions, which we may call

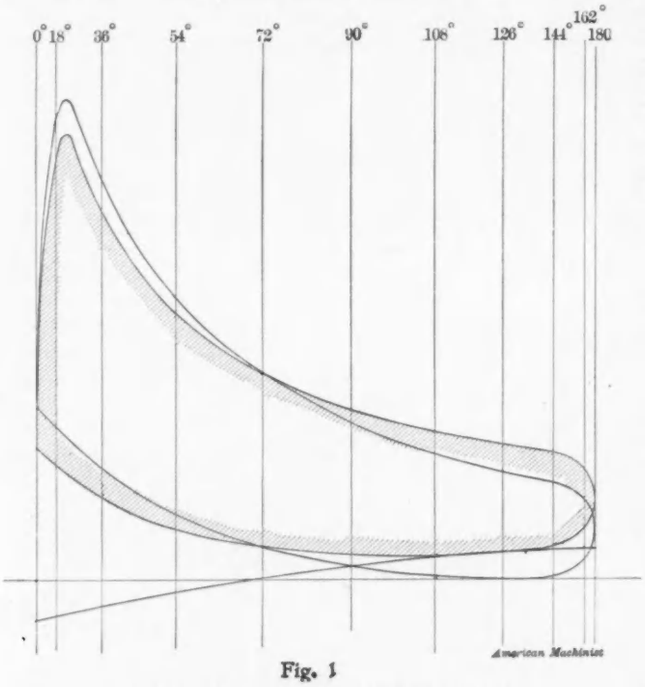


Fig. 1

INDICATOR CARDS FROM GASOLINE ENGINE.

460. Applying the formula, $F_o = 481$ pounds, and $F = 601$ pounds at the top center and 361 at the bottom. With the centers of the cylinders 10 inches apart, the maximum rocking couple will be 7,215 inch-pounds. This does not much exceed that of the ordinary two-cylinder engine with unbalanced cranks, and it has the great advantage of being applied irregularly instead of regularly, so that it cannot set up harmonic vibrations.

We thus see that by adding one cylinder we have produced a 16 horse-power engine whose gross vibration, as felt by the passengers in the boat, does not exceed that of the 7 horse-power engine it replaces. Its weight per horse-power will be less than that of the steam engine, and it can go into a lighter and finer hull. Moreover, its center of gravity will be so much lower than that of the steam boiler that little, if any, ballast will be required. Add to this that the seating capacity of the boat will be 50 per cent. or more in excess of its rival's, and we see that such an outfit would crowd the steam launch hard.

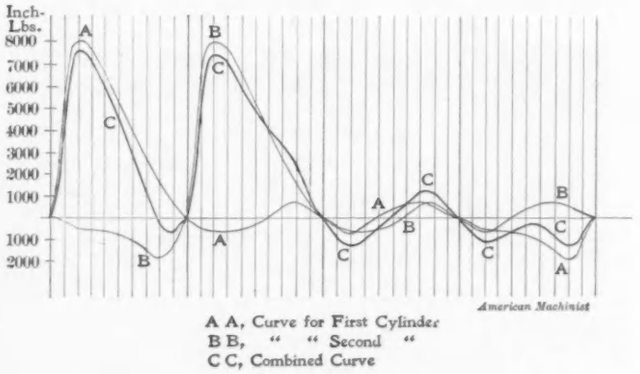
Of course, there are other things to be done—bearings to be re-designed, base stiffened, governor added—indispensable for such an engine—vaporizer and valves enlarged; but all these are matters for the drawing room to handle, and do not belong to the present subject. It will be quite impossible, too, with the frequency of the explosions doubled, to let the inlet valves be opened by suction; the clatter would be beyond endurance. They must be cam-lifted, and the cams must seat them slowly.

Returning to the matter of prompt combustion, an absolute pre-requisite here is that the mixture be homogeneous, and this can only be attained by the use of a carburetter, or of some form of vaporizer which insures complete mingling of the air and vapor before they enter the cylinder. This being provided, the two best-known means of controlling the combustion time are the compression and the time of ignition. Of the former it may be said in general that it should not be too low; and in an engine like the present it will be well to make it fairly high, due care being had to avoid premature explosions.

As to the time of ignition, it is seldom realized how much influence—other things being equal—this feature has on the performance of the motor. An engine designed to run, say, 250 revolutions, and by a change of pulleys speeded up to get more power, soon shows a marked falling off in fuel economy; and this phenomenom is usually attributed to anything but the true cause, which is that the piston has begun to move out before combustion is well under way, and thereafter the flame cannot keep pace with it. To remedy this the ignition must be given a lead, and a very considerable lead if necessary, to utilize to the full the slow movement of the piston near the center. How much this lead may be, builders of vehicle motors are beginning to find out; and they are realizing, too, that a lead suited to one speed is suited to no other. A 2x2¼-inch bicycle motor described not long ago in the "Horseless Age," igniting on the center, gave at 500 revolutions an M. E. P. of less than 15 pounds. Igniting with a lead of one-tenth of a revolution, the M. E. P. was 26 pounds. The necessary conclusion is that in all such cases the lead should be automatic. This was the case in the motor just mentioned, and as higher speeds become the rule in boat engines devices of this sort must accompany them.

A recent writer (George Lieckfeld in the "Engineering Magazine" for July) proposes double or multiple ignition as a remedy for sluggish inflammation in large cylinders, and the suggestion may possibly be useful for smaller ones with high speed. It is doubtful, however, if the sizes at present under discussion are large enough to need such assistance.

To plot the inertia forces on the indicator card is now deemed a necessary part of steam engine designing, but with gas engines this is seldom done. One reason for this is doubtless to be found in the insignificant part played by these forces in the load on the bearings, as compared with steam engines, and their greatly overshadowing influence on hull vibration. Nevertheless, the operation is not without interest of its own, and the writer appends two representative diagrams, one of net piston pressures and one of crank effort. In Fig. 1 the indicator card is taken from Hiscox's "Gas, Gasoline and Oil Engines," and redrawn to a 50-pound scale. It is a rather inferior card, since with a compression of about 67 pounds absolute it gives only a little over 50 pounds M. E. P.; whereas even a 6x7 cylinder, with a good mixture, should give 60 pounds. The in-



A A, Curve for First Cylinder
B B, " " Second "
C C, Combined Curve

Fig. 2

TANGENTIAL CRANK-PIN EFFORT OF TWO-CYLINDER GASOLINE ENGINE.

ertia curve is based on the 6x7 engine, running 340 revolutions, supposed above. From the inertia forces were subtracted the dead weight of the reciprocating parts, and the result plotted in pounds per square inch of piston area. Bearing in mind that inertia varies as WV^2, we can plot similar curves for other speeds. Thus, at 400 revolutions the several values would be increased $(400^2 - 340^2) \div 340^2 =$ about 38 per cent.

It will be seen from Fig. 1 that the pressure on the wrist-pin is upward only about one-fourth of the time, viz., from near the middle of the exhaust, where the piston inertia becomes negative, to near the middle of the suction stroke. During the rest of the time it is continuously downward. This does not take account of the ring friction, but as this should not much exceed the weight of the piston, its effect on the curve will be small.

In Fig. 2 are shown the tangential crank-pin forces for each cylinder and for the two combined, during a complete cycle of four strokes. It will be noted that the effect of the compression is to render the crank effort, and therefore the reaction of the hull, negative. The crank effort may be found by the construction shown in Fig. 3, in which *A B* and *B O* are respectively the connecting rod and crank line. On the line *B O* lay off *C O* = net piston pressure, draw *C D* parallel to *A B*, and *D O* will be the tangential force at the crank pin. This multiplied by the crank radius gives the turning moment for that position. Usually the maximum value is all that is required, and for gas engines this is roughly equal to the crank radius multiplied by one-half the greatest pressure of the explosion.

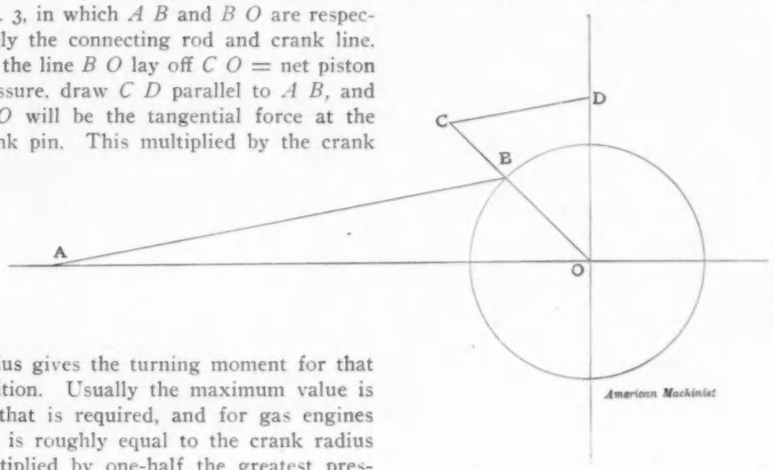


FIG. 3. METHOD OF CONSTRUCTING FIG. 2.

From what has been said above of the paramount importance of speed, it will be seen that, with all its drawbacks, the explosion engine is the most suitable—if indeed not the only—type of internal combustion motor for marine use. It would perhaps be too much to affirm that an engine of the Brayton type, burning its charge at constant pressure, can never be used in this work; but the outlook for it is not promising. The same may be said of the lately invented Diesel engine, despite the announcement of its backers that it is to be adapted to launch service. No undertaking, in the writer's opinion, could be more chimerical. Quite aside from the extravagant amount of flywheel it requires, the physical impossibility of the injected fuel diffusing and burning with the necessary rapidity puts it out of the list of available powers. For stationary uses the Diesel engine certainly has a future before it, but it has no business aboard ship.

The survival of the fittest, it is to be feared, will exclude likewise the two-cycle engine. It would seem on the face of it as if, with its double frequency of impulse, this motor would have undisputed preference. Practically, however, it is not popular. Without discussing the question of its reliability—which might be a sore point with someone—it is enough to point out that the enclosed crank-case adds seriously to its weight; that between the pressure in the crank-case, the necessity of throttling to prevent part of the fresh charge from escaping with the exhaust, and the necessarily somewhat lower compression, both the fuel economy and the power for a given size are less than they should be; and, last, that it is impossible to speed it up with even moderately good results. So far from the two-cycle engine being lighter for its power than the four-cycle, it is more usual to find the conditions reversed.

The reader will not have failed to note that if by the use of three cranks the unbalanced upward force can be eliminated, by the use of six cranks in pairs the rocking couples also may be abolished; and such an engine will have no mechanical vibration whatever, which is more than can be said of any steam engine. Moreover, as it will deliver three impulses per revolution, the curve of crank effort will at no time be zero. The variations in torque reaction will therefore be much less marked; and, in addition, a flywheel will be unnecessary, as the inertia of cranks and balance weights will be sufficient. Such a design could well be called the ideal one for marine service; and while, of course, it would have no place in small craft, yet it is safe to predict that if the gas engine is ever applied to vessel propulsion on a large scale, this will be the design employed. Double or triple screws, with six cylinders on a shaft and piston speeds of 800 to 1,000 feet per minute and upwards, may then be looked for with confidence.

"The Theory and Practice of Getting Jobs."

A paper of unusual pungency, bearing the above title, was recently read before the Illinois Society of Engineers and Surveyors by J. W. Alvord. It is, we regret to say, too long for reproduction; the following rules, given at the conclusion of the paper, however, should certainly be preserved. The writer, it will be remembered, is a civil engineer, but that makes no difference as to the pertinency:

"In the course of a number of years of heartrending experiences I have, I think, discovered a few simple rules for getting jobs which, after much reluctance, I have concluded to give to the profession in absolute confidence. They have not always worked as well as I would like, but they at least give one a fair chance with other professional brothers, and they are as follows:

"1. Find your job.

"This is quite necessary. I have completely discarded the theory on which I started in, that your job should find you. It may work once in a while, but as a rule a needy engineer out of work is a great deal keener hunter than a lonesome job is. After you have found jobs for a good many years it is possible that some stray jobs may find you, but I wouldn't count on it.

"2. Know a great deal more about how that job ought to be done than anybody else around.

"There is no doubt at all but that this is a very important requirement indeed, in the practice of getting jobs, but it is one which I feel almost ashamed to mention, and indeed would have forborne to speak of had it not been that occasionally I have met enthusiastic and confident engineers eager and willing to lend a hand in the great work of harnessing the forces of nature, but a little uncertain as to the difference between the breeching and bellyband. This delightful trait of ambition in our profession should be commended, could it only be turned into proper channels, but the greatest problem we have is how to direct the energies of such would-be members into ethical discussions on the standing of the profession or society resolutions upon the unsatisfactory condition of the remuneration of engineers.

"3. Know the men who have the jobs to give.

"This last rule seems also to be one of those delightfully simple propositions in theory which are found so difficult in practice. The theory of the thing is that an engineer's reputation ought to precede him everywhere. In practice he is usually exceedingly glad if it will only follow him at a respectable distance.

"People with jobs to give want to see you poke your ribs, and put you through your paces, as I have elsewhere intimated.

And if you would like to be their 'hired man' it is best for you to go and submit yourself to the process as gracefully as you can.

"I believe, however, that it is quite possible to do all this and still be modest. There is no money in being bashful, but to be suitably modest at the proper time and in the proper amount is an art whose worth to the fortunate possessor cannot be overestimated.

"Long years of harrowing experiences have frayed the edges and removed the bloom from my own early attempts to be modest. Yet I cannot refrain from referring with pride to one attempt which may prove instructive. In the first year of my apprenticeship the city directory man called at the office in which I was engaged and asked for my name and designation. Naturally, I did not feel at that time that I stood more than upon the threshold of our great and noble profession, so I informed him simply that I thought I might be entitled to be called an 'engineer's assistant.' I am at a loss to determine even to this day whether this was an act of true modesty or mere bashfulness, but this classifier at the central office of that directory had evidently no difficulty in placing me. He had met pretentious people before in his line of business, and when the directory was duly printed and issued I was dumbfounded to observe the appellation of 'fireman' following my name and address.

"It is pretty evident that the business world makes but little allowance for ordinary modesty, but it doubtless has distinct difficulty of its own in designating and classifying a profession which expects a man to drive stakes in a sewer or paint landscapes in the office, corner the elusive bacillus in the laboratory, or throw off a literary gem in the shape of a financial prospectus between meals."

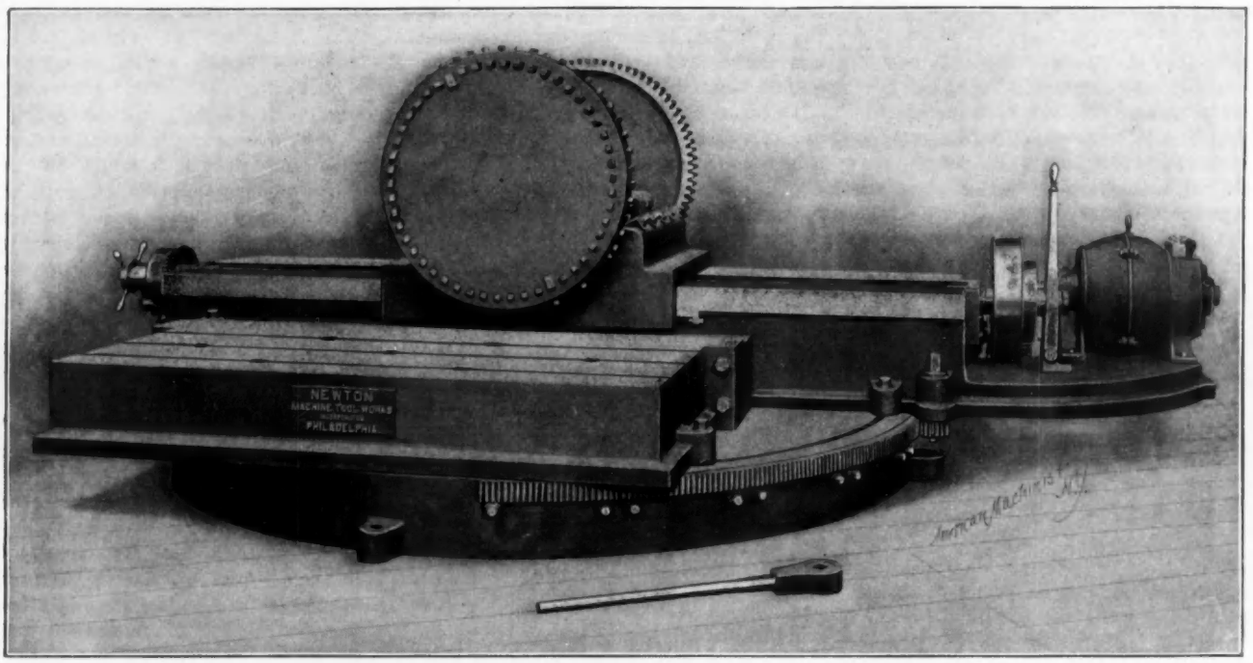
Rotary Planer on Turntable Base.

The use of the so-called rotary planer for facing off the ends of structural ironwork has become very common. The usual form in which these machines are furnished—that is, mounted on a fixed base—answers all requirements so far as the facing of beams which have been cut off at right angles to their length, is concerned. When, however, beams which have been cut off at an angle are to be handled, the fixed-base machine requires the angle to be obtained by swinging the beam sidewise; and as many of the beams are long, this necessitates a large fan-shaped area in front of the machine, which is sometimes difficult to provide, and is always an expensive amount of ground room to provide for such a purpose. The handling of the material is also inconvenient.

The accompanying half-tone shows a rotary planer designed to avoid these difficulties. Instead of swinging the beam to a position which will give the required angle, the machine is mounted on a turntable base, whereby it may be swung about a vertical pivot, the beams occupying the same position regardless of the angle at which the cut is made.

The machine will be seen to be electrically driven, a construction whose flexibility renders it peculiarly appropriate for such a purpose.

Apart from the turntable base, the planer does not differ from others for the same purpose, which are too well known to need detailed description. The machine is the product of the Newton Machine Tool Works.



ROTARY PLANER ON TURNTABLE BASE.

Letters from Practical Men

Logical System of Wages.

Editor American Machinist:

It seems to the writer, who is a mechanic, that all the "pother" going on about piece work, premiums and methods of paying for skilled labor is wide of the real issue. There is nothing to be done to settle the matter but to ascertain a proper price for making work, and then turn it over to the men to be done, and hold them responsible, as is proposed in a recent article in your journal. A man who wants to be paid for what he does not do, or to be paid for his "time," irrespective of what he produces, is a rogue in spirit, if not in fact; there is no such sentiment among American skilled workmen.

No system that does not make workmen responsible is likely to succeed. Men do not want premiums, presents, holidays, or any favor of the paternal form. What they want is justice and fair play. Set off their part to estimate and it will be taken care of. The difficulty of this lies in the common policy of concealing the amount of labor not only to permit speculative profits, but to prevent comparison in wages. A firm which would contract all their work to their men and do work for a reasonable and declared

profit would soon command all they could do in any part of the country.

As it is now, the men want all they can get. They imagine that concealed profits must be large, and that an increase of wages would in any case fall on the final purchaser. The whole system is wrong. To pay a mechanic for his time instead of his work is to make him irresponsible. It is degrading, and sets up a divided house that cannot stand.

There is no kind of work done in a machine shop, and but little anywhere else, that cannot be estimated, as it is estimated, in fact, in every case. If the workmen are not willing to do the work at a proper estimate, they should be turned out for those that will.

"OLD MECHANIC."

Increase Twist Reamers.

Editor American Machinist:

Having seen no mention of the reamer question recently, I had concluded that the subject has been exhausted, or that no one is having trouble making perfect holes.

Last spring I dropped in on Prof. Sweet, and after a very profitable and instructive visit about his most interesting shop we wound up on reamers. The result was that I decided to try increase

AN INCREASE-TWIST REAMER.

spirals on a hard phosphor-bronze bearing. As near as I can determine, we have succeeded in making a hole both smooth and round.

Making the reamer with an increase spiral proved more of a proposition than it looked. I figured out a means of cutting them with little trouble, and thought that ended it. Just make a round end on the guide finger and grind 'em? Well, hardly.

A trial proved that the round end finger would grind an increase angle cutting edge, increasing until the clearance was wrong way about. A finger ground to a point with a very sharp edge on the grinding wheel did the trick quite nicely.

The spirals I used start with a turn in 16 inches, and increase to a turn in 8 inches, in 4-inch length of reamer ⅜-inch diameter. The rig for cutting the flutes is very simple and inexpensive. I used a small pair of B. & S. index centers, removing the worm and substituting for the index worm wheel a gear with twenty-four teeth, then put a gear with ninety-six teeth on a stud on an arm.

An arm swinging on the same stud with the ninety-six-teeth gear has a pin to engage with the teeth in the large gear. This serves as an index, the arm extending beyond the gear sufficiently to clear the table of the mill and resting on a cam clamped to the saddle. The cam is proportioned to give the desired spiral on the small diameter.

The table angle is controlled by two vertical pivots having a horizontal rod passing through them and held by set screws.

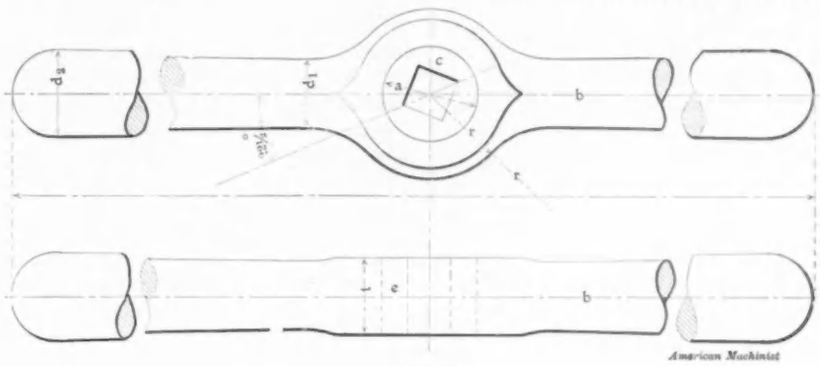


Fig. 3

AN APPROVED TAP WRENCH.

One pivot is clamped to the tool shelf and the other to the table.

A few trials will adjust the pivot on the table so that it will swing the table as it moves forward to the proper angle for the spiral.

If the increase on the cam is constant, this method brings the angle as nearly perfect as necessary. The reamer shown will speak for itself. While this is by far

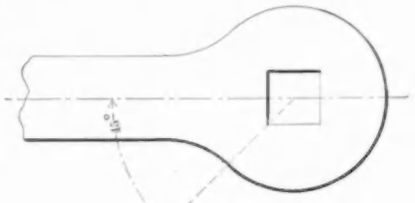


Fig. 1

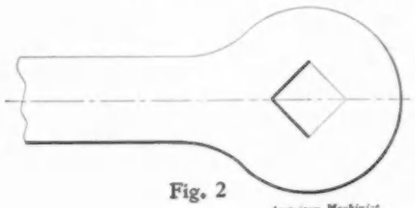


Fig. 2

American Machinist

THE USUAL FORMS WRONG.

the most perfect form of reamer I have ever used, I have had to discontinue them on the job; but that is another story, and I will tell you about it as soon as I get time.

W. A. WARMAN.

Taps and Tap Wrenches.

Editor American Machinist:

There are some points about taps and tap wrenches which, though familiar and well understood by the initiated, are yet so often ignored that it may be worth while to here again call attention to them.

Nearly all shops now use the so-called "store taps" kept in stock by dealers, and to be had in standard sizes at a moment's notice. These taps, with few exceptions, give good satisfaction, an occasional failure being due to faulty temper. As is well known, the shanks of these taps are turned down slightly smaller than the bottom diameter of the thread, to allow the tap to be run through the work or for use in deep holes; the size of the square for the wrench is, of course, limited by the size of the shank, and it has been suggested that the size of the shanks be increased to the full or body size of the tap, the object being to prevent the rounding of the corners and twisting of the square of the tap.

While this might remedy the trouble to a certain extent, these taps would not find favor with mechanics generally, and the source of the trouble can be found much nearer home, as an examination of the tap wrenches will show; not uncommonly one solid wrench is used for several sized taps, the only limit being its ability to turn the tap; again a monkey wrench, in its last stages of dissolution, will be used in a corner where the range of the wrench is limited; such wrenches as were once fitted are probably ruined by being used on some of these twisted and rounded should-be squares.

I recently came across an old nut tap, one that had done lots of hard work; in fact, the condition of the threads would indicate that, latterly at least, considerably more force was exerted on the square shank by the machine than the average machinist would ever use on a hand tap;

but the square was practically as good as new. An investigation showed that the tap was a fit in its socket; while allowing the tap to be freely inserted and removed, there was no unnecessary shake, and the other taps for the set were in equally good condition.

If the same conditions prevail with hand taps and wrenches there ought to be equally good results.

A great many adjustable tap wrenches are made and used, but they are all open to the same objection—when a complete turn of the wrench is impossible it becomes tedious to readjust the wrench, and if left loose they are a little worse than a poorly fitting solid wrench, being in many respects similar to a monkey wrench.

Generally tap wrenches are made as in Figs. 1 and 2, some pains being taken to have the diagonal of the square either in line with the handle or at an angle of 45°, as shown; in this way the least angle in which the single wrench can be used is 90°, unless two wrenches, as shown in Figs. 1 and 2, are employed.

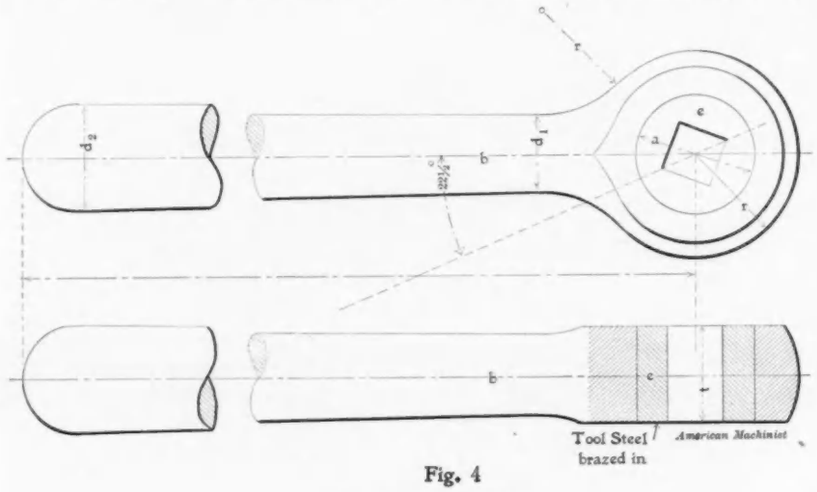


Fig. 4

SOME TAP WRENCHES.

Several years ago I made a set of wrenches for taps from ¼ inch to 1 inch, with the diagonal at an angle of 22½° with the handle. This gives just double the range, when the arc of rotation is limited by some obstruction, making it possible to use the single-ended wrench in an angle of a little more than 45° by simply reversing the wrench.

As tool steel was a scarce article in that shop, and I insisted on a tool steel eye, a compromise was effected by making, as in Figs. 3 and 4, the body *b* of machine steel and the eye *e* of tool steel. The body was bored and the eye fitted and lightly riveted to hold in place while brazing; the turning then removed all scale and spelter. This makes a cheap and durable wrench, and the eye can be easily replaced when worn.

Taking the diameter of tap for a unit *D*, the proportions used for double wrench were: $b = 24\ D$; $t = D$; $d_1 = D - 1\text{-}16$ inch; $d_2 = D + 1\text{-}16$ inch; $r = D + 1\text{-}16$ inch; $a = D + \frac{1}{8}$ inch. For single-ended wrench $b = 16\ D$, the other dimensions being the same. G. J. M.

Milwaukee, Wis.

Two Pattern Shops.

Editor American Machinist:

I recently had an opportunity to compare a modern pattern shop, doing custom work or jobbing, with one that has been running for nearly twenty years to make patterns for repairs and shop tools for a railroad company. The latter shop employed one man, who was satisfied with the same tools, with a few exceptions, that he bought when an apprentice, and as for machinery, a lathe, about 20 inches swing, with a wooden head, and perhaps a trimmer, was all that there was. All sawing, whether ripping or cross cutting, was done by hand, unless it was of sufficient quantity to give an order to the mill carpenter. Shellacking, stopping, rubbing down and crating were done by the same man, and, of course, at the pattern maker's rate of wages; but the employers were satisfied and everything went smoothly.

But in the modern shop there was quite a difference. Perhaps the most prominent feature was the band saw, which was kept busy nearly all the time by some of the six men employed there, and I noticed that the proprietor expected the sawing to be done so close, and with proper draft allowance by tilting the bed, that in most cases sandpapering was all that was needed after it. Then there was a circular saw bench of modern make, with two arbors, one carrying a rip saw and the other a cut-off. Either could be lowered below the surface of the table, and the gage guard could be adjusted to saw at different angles. There was a "pony" planer, and last, but not least, was a jointer, which would joint work true enough to glue up without any hand planing. It was also used for facing segments, and sometimes for reducing stock. Each man was expected to make a point of doing all by machinery that could possibly be done and save time. Another feature was that none but the very best glue that could be procured was ever used, and there is quite a range of quality in that material. Of lathes there were two, and those were the only tools that were not up to date. There was an ample supply of hand screws, also the most improved clamps, which latter were not used much, the men simply dogging the work together with the small steel dogs made to draw by driving across the joints. The employees had a fine equipment of bench tools, that enabled them to lay out or prove their work, no matter how difficult the shape. The employer also kept a set of templets for working curves or round corners from ½ inch radius up, as recently shown in your columns. WM. NEWTON.

Oneonta, N. Y.

Punching and Drawing Ferrules.

Editor American Machinist:

In the accompanying drawing Fig. 1 is a central sectional view of a punch and die for forming a tin ferrule at one stroke of the press. Fig. 2 is a plan of the face of the punch, and Fig. 3 an outline or section of the ferrule to be made.

The main punch *C* is of soft tool steel, and has the stem *c* turned integral with it. *E* is the small punch with stem *e* driven into the main punch and slightly riveted. *B* is the cast-iron body of the die, and has lugs for bolting to the press. *K* is the die proper, or cutting edge, and is of hardened tool steel, ground inside, on the bottom and outside. *J*, the die center for forming the ferrule over, serves also for the small cutting edge and is of hardened tool steel lapped inside. *H* is the drawing ring, which

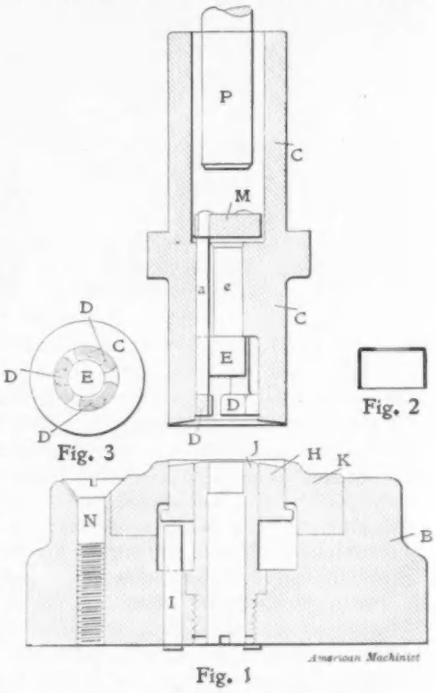


Fig. 3 Fig. 2

Fig. 1

PUNCHING AND DRAWING FERRULES.

is pressed up tightly against the face of the punch by a large spring (not shown) acting on the three pins *I*. This ring *H* also pushes the ferrule up off *J* after it is formed. To extract the finished ferrule from the punch *C* three pins *d* are used, which have heads on their lower ends fitting the annular space between punches *C* and *E*, and are driven tightly into a disk *M*, which strikes the stationary knockout *P*. The holes for pins *d* are drilled somewhat larger than the space between punches, as shown in Fig. 2, and the pins *d* are flattened on the inner side.

In your issue of August 17 you show a die for a similar operation, but which works on thicker stock, and I think Mr. Coutlett would experience some annoyance with the inner punch of his die if he was using it on light stock, for there are two moving joints between his punches, and no rigid fastening. This is all right on thick stock, because the punch is smaller than its die on thick stock, while it completely fills it on thin stock.

RIGGS.

Another Boring Tool.

Editor American Machinist:

Having read a number of articles of recent date on boring tools of various descriptions, I would like to describe a tool of my own make, which I believe is original. At the time this tool came I was employed in a shop in the central part of Ohio. This shop at that time was building turret lathes. It being a new venture, and the shop employing but few men, it could not support a blacksmith, and every machinist had access to the forge, where he did his own forging and tool-dressing. There was a portable forge in the basement, and a boy to do what striking was necessary.

Having been given the job of finishing the cones for these lathes, Fig. 3, which were turned all over, I placed one of them in a chuck and trued it ready for boring. My next job was to find a boring tool long enough to bore through the cone, and, finding none, I proceeded to the basement and forged a tool, to the best of my ability. The tool was so long and slender I was unable to get below the scale on the casting. At last, giving up in despair, I went to the foreman and told him my troubles. He said he didn't see any reason why the tool would not work if it was properly ground, and tried it, to satisfy himself, but with the same result. I then approached him with the subject of making a tool and holder. I explained my idea to him, and told him I was sure such a tool would do. I could not convince him, but he at last consented to let me make the tool. I got a pattern made and then the casting for the standard, Fig. 4. This I planed with a tongue on the bottom to fit the top of the rest and secured it by a bolt in the center. The hole for the tool I drilled near the size, and then bored true with a small bar on the centers, and put in the two ⅜-inch set screws. I made two bars of 1-inch round steel, one bent and the other straight, and of the right length. The nose was cut away taper on the two sides, and two ¼-inch holes were drilled obliquely, as shown, and crossing each other in the center, where I had a ¼-inch set-screw to hold the little tools that did the cutting, and when I had these all lipped and ground I was ready for business.

With the tool in the position *B* I did the boring, and that and turning the inside of the cone was all I had calculated to do with the tool, but while boring I conceived the idea that I could turn the whole surface of the cone with the same tool. With the cutter in the same position I turned surfaces marked *J* and *M* and faced *K*. I then changed the tool to *A*, and turned and faced the hub and turned the large step *F*. I then used the bent tool, Fig. 2, and with *D* I turned *Q* and faced *G*, also that part of *H* that was not held in the chuck, and faced *N*.

I had thus finished the entire cone except the small part held in the chuck. I then went at the task of convincing the foreman that I had a good tool, but he would not be convinced. To give him his just dues, however, when I left there that was the only tool that he would allow to be used for turning cones.

A. F. HORTON.

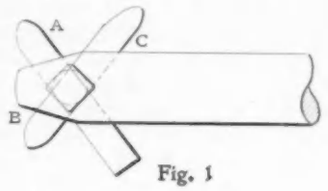


Fig. 1

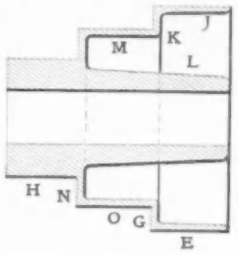


Fig. 3

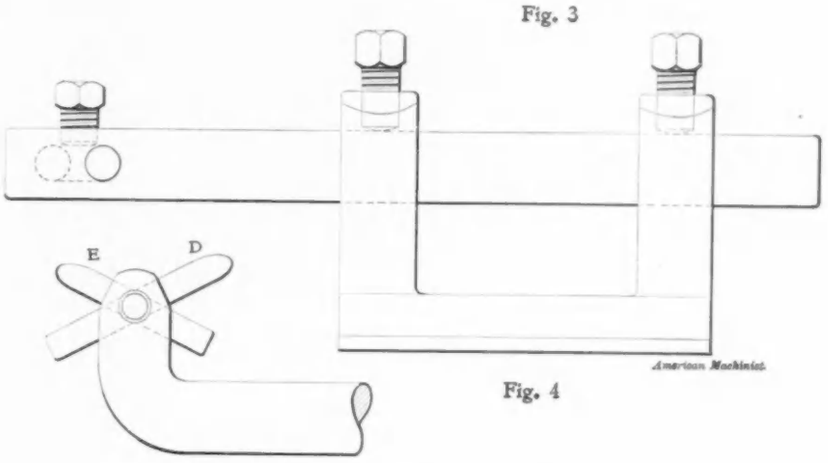
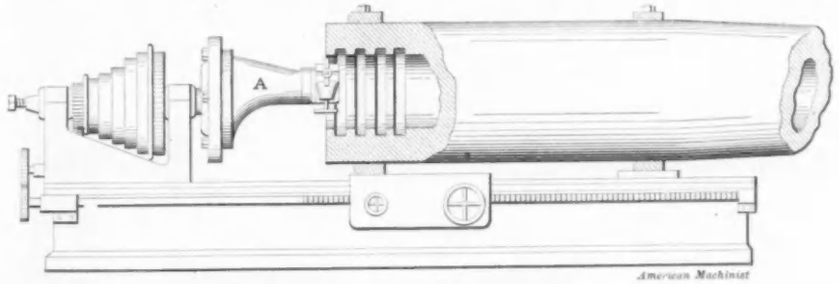


Fig. 4

Fig. 2

A BORING AND TURNING TOOL.



OLD RIG FOR BORING THE BREACH OF A GUN.

Boring the Breach of a Gun.

Editor American Machinist:

The sketch shows how we got along with a job of gun work that came to us in a shop in New York city more than fifteen years ago. We had to bore and cut the thrust grooves in the breach of a cannon, and we had to devise something to do it with. First, we got up the taper head *A* to fasten to the face plate of our large lathe. Then we fastened one of our lathe slide rests on the small end, as shown. With this we could reach in and cut out the grooves in good shape. The gun was too heavy to swing in the lathe and cut out with a boring tool, so this method was adopted: We clamped the gun to

the carriage with hardwood clamps and bolts. In this way we could move the work along from one groove to another as we cut them out. If we visit a modern gun works we will not see this in use, but it did our job all right, and finished the gun while someone was designing the large lathes now in use. H. S. BROWN.

Drawing Flanged Cups.

Editor American Machinist:

In the designing of dies for drawing up plain cups by the reducing process no rule can be given whereby the number and diameters of the different dies to use for any one single cup can be determined. Practice and long experience chiefly govern the making of the dies and the doing away with the unnecessary experiments. Smooth polish, lubrication and not too long a surface bearing in the depth of the dies are points essential to secure.

Fig. 1 shows the external outlines of three drawing operations to produce a cup 15-16 inch long, 13-16 inch diameter, and with a flange diameter of 1 1-16 inches, from a soft brass blank 1⅞ inches diameter, 1-32 inch thick. Fig. 2 is a section of the finished cup.

The drawing dies are plain round ones, with square shoulders on the under side to strip the work from the punch as it is pushed through. The punches for the first two operations taper .002 inch in 1 inch; the third one is perfectly straight. All are provided with air holes to facilitate the stripping of the cups. Annealing is necessary after each operation. Following the drawing operations is the squaring off the ends in a lathe to the desired length to form the flange, and the flanging follows, as here shown.

Place the cup in the die, Fig. 3, which is made .002 inch larger than the last of the three drawing dies, and as it is forced down by the punch Fig. 4 the knock-out *A* in the die descends and brings up on the bottom; meanwhile the flange is being turned out by the radius in the punch *E* and flattened out by the shoulder *F*, when it comes in contact with the face of the die. As soon as the punch is elevated clear of the die, the work is raised sufficiently to be removed by the operator, by the knock-out *A*, Fig. 3, moved upwards by the ⅛-inch coil spring *C*, which is regulated by the jam-nuts *B*. *D* indicates holes for the air to escape.

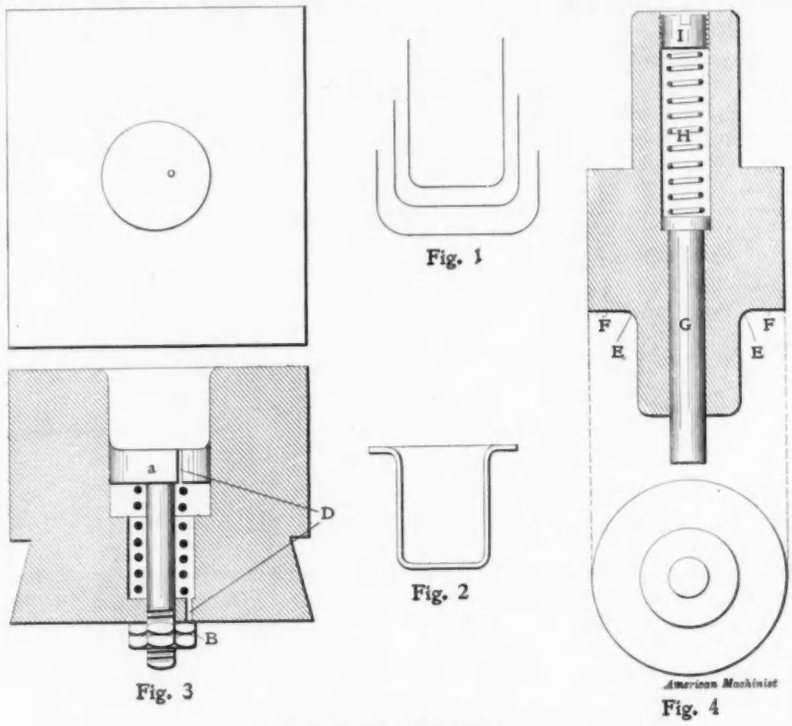


Fig. 1 Fig. 2 Fig. 3 Fig. 4

DRAWING FLANGED CUPS.

The spring pin *G*, Fig. 4, should project below the end of the punch far enough to shed the work, and to press firmly on the bottom by the time the action of turning the flange begins; otherwise, the pressure that is exerted on the upper end of the cup in forcing out the stock will cause the bottom to bulge. The spring *H* is 1-16-inch wire; *I* is a screw plug to hold the spring in place and to adjust the tension.

DIE MAKER.

Lynn, Mass.

That Broken Crank Shaft.

Editor American Machinist:

An article in the "American Machinist" for September 28, about repairing a broken crank shaft called to mind a job we had about a year ago. This was repairing a broken gas engine shaft (of which I send you sketches), the makers having failed and it being necessary to use the engine. The shaft was about 2 x 30 inches, broken at *O*, Fig. 1. We cut off both pieces on line *x*—*y*, Figs. 1 and 2, got out a piece like Fig. 3, put dowel pins in at *m*, Fig. 2, and shrunk on two bands like Fig. 4. Upon putting the shaft in the lathe to finish the center bearing, it was found to run practically true. The whole job was done in a day, and the shaft is still in use. E. C. JARVIS.

Lansing, Mich.

Draftsman's Curves.

Editor American Machinist:

I see the enemy of irregular curves is still on deck. As I understand it, his objection to them is more on account of the pattern maker than the draftsman, as the former has to enlarge the curve to full size.

A few days ago I was called upon to design mounts for a pair of 6-inch Spanish guns which Dewey sent to the bottom of Manila Bay, and which are now located in front of the Capitol here. There was no time to monkey with copper wires and I didn't have a set of R. R. curves to patch together even if I had wanted to. With the aid of irregular curves and a sheet of the cross-section paper the "American Machinist" has so often recommended, I

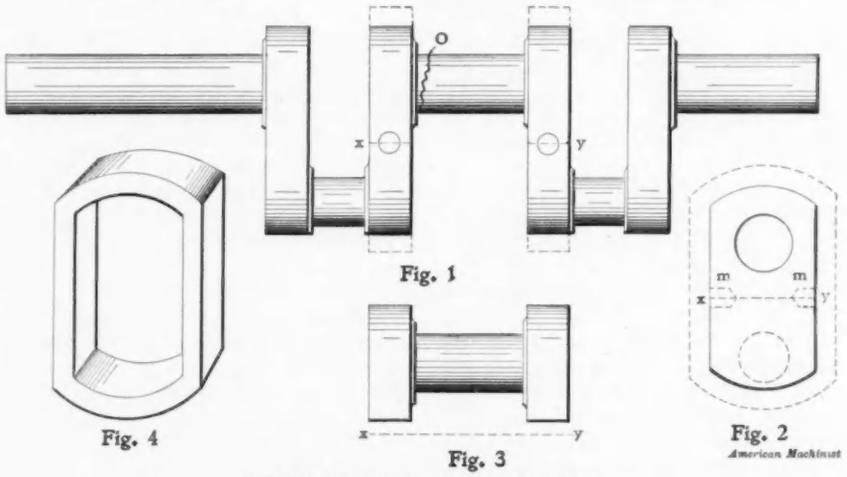


Fig. 1 Fig. 4 Fig. 3 Fig. 2

REBUILDING A BROKEN CRANK SHAFT.

soon had a satisfactory outline. The scale I used made the cross lines 2 inches apart, and it took the pattern maker and myself about 15 minutes to draw the cross lines, locate points in the curves and fill in a line to bandsaw by.

Now, this is very likely the same old way Noah used on the hull of his ark, but for general handiness I have yet to find a better. At any rate, it answers up here in the backwoods and—well, we raised Dewey in these woods. I wish friend Danse would tell why he didn't ink his curve by the same means he used to pencil it. It was not a case for the "artistic pattern maker" to worry over that time, sure. E. R. PLAISTED.

Montpelier, Vt.

Questions and Answers.

Name and address of writer must accompany every question. Questions must pertain to our specialties and be of general interest. We cannot undertake to answer by mail.

(94) A. T. S., Chicago, writes: I have a 32-gallon tank filled with water on which I require a pressure of about 5 pounds to the inch while being drawn off. To what pressure must I compress air in a tube 2 inches diameter and 6 inches long to supply the above tank? A.—As 1 gallon is 231 cubic inches, the cubic capacity of the tank is $231 \times 32 = 7{,}392$ cubic inches. The capacity of the proposed compressed air reservoir is $2^2 \times .7854 \times 6 = 18.85$ cubic inches. When the last of the water is expelled from the tank there should be a pressure of 5 pounds of air in the tank and in the air reservoir. Then, saying nothing about the contents of any connecting piping that may be required, the volume of air will be $7{,}392 + 18.85 = 7{,}410.85$ cubic inches at 5 pounds gage pressure, or $5 + 15 = 20$ pounds absolute pressure. As all this air must at the beginning be contained in the air reservoir, the absolute pressure required in it will be inversely as the volumes, or $18.85 : 7{,}410.85 :: 20 : 7{,}863$ pounds absolute pressure, or $7{,}863 - 15 = 7{,}848$ pounds gage pressure. The scheme is of course impracticable on account of the small capacity of the proposed air reservoir. With an air receiver having the same capacity as the water tank, the case would be different. Then, saying again nothing about pipes or leakage, the initial pressure required would be double that of the terminal pressure, or $20 \times 2 = 40$; the gage pressure, of course, being $40 - 15 = 25$.

(95) R. A., Providence, R. I., writes: In reading scientific papers I have frequently met with the expressions "unit of heat" and "unit of work." Now, I know that a unit is a measured quantity, such as a pound of butter, but I do not see how it is applied in the way mentioned. If you will explain the thing to me in the "American Machinist" you will help out others besides myself. A.—In the case of the butter, referred to by our correspondent, the unit is the pound, which is the unit of weight, or the measure of weight in common use. The unit of heat, or, as it is commonly called, the British thermal unit, is that quantity of heat which is required to raise the temperature of one pound of pure water 1 degree Fahrenheit at or near 39 degrees, the temperature of maximum density. The precise temperature is not of great importance, except where minute accuracy is required, but the weight of the water is a most important particular. Any definition of the unit of heat which does not specify the weight of the water heated of course defines nothing as to the quantity of heat employed. We may raise the temperature of a pound of water or of a thousand pounds of water one degree, but it takes a thousand times as much heat in the latter case. The time consumed in the operation of heating is not an element of the case, as the same quantity of heat will be required whether transmitted quickly or slowly. The quantity of heat represented by the British thermal unit, as defined above, is equivalent to the mechanical energy required to raise 1 pound 772 feet. A unit of work is the foot-pound or the raising of 1 pound 1 foot. It is to be noted that in this definition no time is specified. When the time limit is included we have then a unit of power, or a measure of the rate at which work may be done, or of the ability to do work. The common unit of power is the horse-power, which is defined as the ability to raise 33,000 pounds 1 foot high in a minute. The horse-power hour is a larger unit of work which it is often convenient to use, and it means, of course, the amount of work that may be done by one horse-power operating for one hour, or in foot-pounds it is $33{,}000 \times 60 = 1{,}980{,}000$ foot-pounds. If we have a statement of a certain number of horse-power hours of work done, that in itself gives no information of the horse-power employed. A 100 horse-power engine working for ten hours, a 10 horse-power engine working for 100 hours, or a 1 horse-power engine working 1,000 hours would each do the same amount of work, 1,000 horse-power hours. These things do not usually become clearly defined in one's mind without some study of them, but a clear comprehension of them is necessary if one is to do much with engines or with power.

The French Machine Tool Trade.

During the year 1897 the importation of machine tools into France was as follows:

From Germany	2,027,586	francs
From United States	1,611,032	"
From Great Britain	1,222,325	"
From Belgium	672,750	"
From Switzerland	236,000	"
From other countries	143,740	"
Total	5,913,433	francs

As will be seen from these figures, the second place in this trade is held by the United States. It is very satisfactory to record that our tools have made great strides ahead in the French market, but more could be done if the right steps were taken by our manufacturers.

German tool makers are not only represented in Paris, but they personally canvass the field to a large extent, and there is no doubt that by so doing business is brought about. The importation of machine tools into France is constantly increasing. During the first eleven months of 1898 it amounted in value to 7,552,050 francs, as compared with 4,594,085 francs during the same period of 1897, and 3,274,514 francs during the same period of 1896. In 1895 the total imports of machine tools amounted to a value of 5,186,526 francs, to which the United States contributed but 431,666 francs, and by that time the greater part was supplied by Great Britain, Belgium and Germany.

On the other hand, it cannot be disputed that during recent years the French machine tool industry has made rapid progress. This is best seen from the figures of export. Thus, in 1897 the exports of machine tools from France, according to the official French returns, amounted in value to 5,780,046 francs, or nearly the same amount as that of the importation.

The countries whose offtake was the largest are:

Belgium	1,825,820	francs
Great Britain	1,033,600	"
Switzerland	619,200	"
Germany	528,000	"
Italy	235,200	"
Spain	208,000	"
Argentina	150,400	"
Russia (Baltic)	142,800	"
Brazil	136,000	"
Portugal	105,600	"
Mexico	88,000	"

The trade in machine tools between France and her colonies and protectorates is also increasing. Algeria, in 1897, took 112,000 francs worth; French Indo-China, 49,960 francs worth. The total exports to the colonies were valued at 265,932 francs in 1897.

The trade in small hand tools is also very considerable, the imports in 1897 having amounted in value to no less than 4,128,895 francs; of this the great bulk was of German origin, viz.: 2,378,400 francs. Great Britain supplied small tools to the amount of 1,015,180 francs, whilst the third place was held by the United States, with 517,160 francs. Of all these tools, 176,182 francs worth were of iron, whilst 3,940,386 francs worth were of steel, or of iron tipped with steel. During the first eleven months of 1898 the importation of this class of tools amounted to the value of 3,184,860 francs.

The French exports of small hand tools were, in 1897, in excess of the imports, viz.: 7,512,776 francs. Here, again, as in the machine tool trade, the best customer was Belgium, having taken 1,146,000 francs worth of them. The next best customers

were Switzerland, 726,500 francs; Germany, 731,000 francs; Spain, 497,000 francs; Italy, 506,100 francs; Russia, Argentina, Brazil, Turkey and Egypt.

The French colonies and protectorates received of these tools the amount of 1,073,309 francs, of which the greater quantity went to Algeria, French Indo-China and the Island of Madagascar.

During the first eleven months of 1898 the exports of small tools were valued at 5 589,095 francs.

On the whole, it may be said that American machinery and American tools have made great headway in France during the last few years. In agricultural machinery, for instance, we are now far and away at the top of the French trade, and there is every reason to suppose that by energetic and systematic efforts our share in the French machinery import trade could largely be increased. The few drawbacks we have to encounter, such as the maximum tariff to which American goods are subject, and, perhaps, higher freight rates, are fully equalized by many advantages we enjoy over our European competitors.

G.

For Resharpening Files.

A United States patent has recently issued for a new compound to be used with a blast for resharpening files. We, of course, are unable to vouch for its efficiency, but the inventor's account of his scheme will be read with interest. He says:

"Many attempts have been made to resharpen tools of this character by the use of a sand-blast; but the gritty character of sand, no matter how fine, has made such attempts, so far as I am aware, unsuccessful, for the reason that sand destroys the serrated surface by breaking the teeth instead of sharpening them. My new composition is composed of elements which, when dry, constitute a nearly impalpable powder without any gritty quality, but which, nevertheless, is exceedingly effective as a resharpening agent. As the basis or principal ingredient in my compound I utilize a particular waste product especially adapted to my purpose, and thereby make it of some commercial value. This product is a residuum left after the separation of the precious metals from their ores by the wet process of washing and concentration. The ores (quartz or porphyry, or a combination of both) are pounded in stamp mills to a powder, the free gold amalgamated, and the wet pulp fed to the concentrator tables or shaking belts, where a further concentration takes place. The heavier particles are retained on the tables or belts, while the lighter material is run off either to waste or into settling tanks. In such tanks a further separation takes place by gravity, the sand and heavier particles sinking, while the lighter "slimes," as they are termed, remain nearer the top. These concentrator-slimes are composed of finely comminuted quartz or porphyry and water, and are of a smooth, greasy character, the mineral matter being practically impalpable. This mineral matter, however, is of the hard, abrasive nature suitable for my purpose, without being gritty, and hence destructive. I use about eighty-five parts of this concentrator slime, about five parts of calcium carbonate, about five parts of powdered corundum and about five parts of caustic potash. These elements, being mixed together, are treated with a sufficient quantity of water in a suitable vessel, being washed and stirred therein for a sufficient time, as in lixiviation, and then drawn off from the upper part of the vessel. Powdered corundum is added in a small quantity, on account of its exceptional abrasive quality, and caustic potash, because of its effect as a cleansing agent when brought in contact with the oil and dirt on the surfaces of the files to be sharpened.

"The compound in use is mixed with water and ejected through a suitable nozzle against the surface of the file, the latter being held at an angle, so that the impact is against the inclined rear surfaces of the teeth. These surfaces are thereby worn down, so that the blunt edges are effectively restored to their original sharp condition. Any kind of an impelling force may be used; but I prefer a jet of steam, which also assists in cleansing the surface of the file. I have given ingredients and proportions which form a practical and effective composition for the purpose, and which I have successfully used."

Technical Publications.

We have received from the Directory Publishing Company, Ltd., London, a copy of the "Universal Directory of Railway Officials for 1899." The directory contains statistics regarding the railways of the world, giving names and addresses of officers, length of road, etc. In addition, it has an alphabetical index of railway officials, list of manufacturers and dealers in railroad supplies, machinery, etc. The book is bound in cloth and contains 530 5x8½ pages.

"Key to Engines and Engine Running." By Joshua Rose. 405 5¼x7¾-inch pages, with 164 illustrations. D. Van Nostrand Company. Price $2.50.

The character of Mr. Rose's writings is by this time, we think, pretty well understood. On the whole, they have probably had a good influence, as they have led many to buy and read books who otherwise would not have done so; but they are full of inaccuracies and positive errors. This book is characteristic of its author, and that sufficiently describes it. Material for it has been hoed together, manufacturers' electrotypes being freely used. The book is chiefly descriptive, and describes pretty much everything connected with the steam engine, and in these portions is, in the main, accurate. Like most authors of his class, Mr. Rose shows himself to be in deep water, without knowing it, whenever he goes beyond this and endeavors to discuss such subjects as power, work, heat, etc.

A party of Cleveland business men and philanthropists visited the factory of the National Cash Register Company, at Dayton, O., on September 27, and were very much impressed by what they saw there. They were entertained at noon at the officers' club, where, after luncheon, Mr. Ambrose Swasey, of Warner & Swasey, in moving a vote of thanks for the day's instruction, said that "the three great elements of success are methods, means and men." He believed that in that factory these essentials had received the highest attention, and that the success attained was remarkable. He found in the thoughtfulness for employees the key to all these results, and said, "I feel that I am going away a better man, prepared to do more for those with whom I may be connected."

The Ferracute Machine Company, of Bridgeton, N. J., recently gave a day's outing and excursion to all their employees, their wives, mothers, daughters and sweethearts, numbering in all something over 400. A steamer was chartered, which sailed from Bridgeton to Woodland Beach, where the day was spent in social enjoyments of various kinds, the occasion being a very enjoyable one and well calculated to increase the good feeling already existing between this company and its employees.

The passengers on one of the transatlantic steamers that arrived in New York the other day complained of the condition of the steamer. Possibly, and even probably, there was more or less cause for complaint, but it is evident that at least one of the passengers would have been wiser had he refrained from going into details. He is quoted as saying: "The slides where the guiding-rods to the piston enter the cylinder were so worn that packing was necessary to keep the steam from escaping. This packing, instead of being metallic, was some soft material which

(*Continued on page 39.*)

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting. Grant ; see p. 16.

Caliper cat. free. E. G. Smith, Columbia, Pa.

Forming lathes. Mer. Mach. T. Co., Meriden, Ct.

Punches & dies. Wal. M. Wks., Waltham, Mass.

Rawhide, fibre and hard rubber gears. The Arthur Co. (See page 8.)

Construction and repair of Commutators, 50c. L. C. Sharp, Omaha, Neb.

Light and fine mach'y to order; models and elec. work specialty. E. O. Chase, Newark, N. J.

Book "Dies and Diemaking," $1, post paid. J.L.Lucas,Bridgeport,Ct. Send for index sheet.

Selden Packing for Stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., New York.

For Sale—Pair of Robertson-Thompson indicators in case, complete, with four springs, in excellent condition; price $50 cash. Box 433, Auburn, N. Y.

Wanted—One 8x16 in., 12 in. stroke compound engine; also one 12x24 in., 16 in. stroke compound engine; all marine reverse. Address Herman Fletcher, 140 Fifth st., Louisville, Ky.

Wanted—One 36x36 by 8 to 12 ft. vertical milling machine of standard make, either new or second hand. Address, with full particulars, The Harris Automatic Press Company, Niles, Ohio.

An experienced designer will furnish complete and original working drawings to any concern desiring to build a line of trade duplex pumps up to 10x6x10 in.; write for prices. Box 340, AMERICAN MACHINIST.

Institutions retiring from business having machine tools, brass and wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

Correspondence is desired with responsible and competent parties who will join the advertiser in the lease or purchase and management of large machine shop; now employing 200 men and doing profitable business; equipment nearly new. Address "High Speed," care AMERICAN MACHINIST.

Wants.

Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisements under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Foundry foreman wishes position; heavy or light castings; 12 years' experience. Box 344, AMERICAN MACHINIST.

Mechanical engineer, member of A. S. M. E., with 10 years' practical experience, wants position. Box 294, AMERICAN MACHINIST.

Wanted—Position as superintendent; experienced in manufacture of machine tools; have a record of success. Box 350, AM. MACH.

Party with machine shop and drafting room, general supervision of details and management of labor, desires a situation. Box 1429, Boston, Mass.

Experienced marine engineer desires work which can be done outside office hours; specifications, plans and inspection. Box 322, AMERICAN MACHINIST.

Engineer with large experience, practical and theoretical, in steamboat construction, wishes opportunity to show ability. Box 343, AMERICAN MACHINIST.

Position as superintendent or assistant; 20 years' experience in various capacities; practical, reliable and energetic; familiar with manufacturing. Address Box 345, AM. MACH.

Mechanical engineer and draftsman, familiar with the calculation and designing of gas compressors and steam engines, gas liquefaction (CO_2, NH_3, SO_2, etc.), ice and refrigerating plants, wishes to change. Box 342, AMERICAN MACHINIST.

Mechanical engineer (28), some shop experience, successful superintendent 4 years factory in chemical line, now under contract to keep out of that branch, desires opening with engineering or manufacturing concern; moderate expectations. Box 321, AM. MACH.

Wanted—Position as superintendent, by an American, who is a thorough mechanic and prefers high-class automatic machinery; I now hold position of superintendent, and can furnish highest reference as to ability and character by present employers. Address Box 323, AMERICAN MACHINIST.

Engineer or manager desiring services of systematic, industrious man with thorough knowledge of design, estimating and correspondence in connection with high-duty steam engines and pumping machinery, and with first-class record as manager of drafting room and in other positions, should address Box 341, AMERICAN MACHINIST.

Help Wanted.

Wanted—An experienced designer on jig and tool work. Box 338, AMER. MACHINIST.

Wanted—An efficient machinist to take charge of gang in machine tool shop. Box 339, AMERICAN MACHINIST.

Wanted—First-class tool makers and machinists, accustomed to gun and bicycle tools and fixtures. Rem. Arms Co., Ilion, N. Y.

Wanted—Competent foreman for press-room; 15 presses on bicycle work. Address "Pedals," care AMERICAN MACHINIST.

Wanted—First-class man as assistant layer-out; state wages and references. Address "Layer-out," care AMERICAN MACHINIST.

Wanted—A draftsman who has had experience on turret and engine lathe design; good pay for the right man. Box 334, AMERICAN MACHINIST.

Wanted—Draftsman conversant with machine designs and general office work of a machine shop. Address Studebaker Bros. Mfg. Co., South Bend, Ind.

Wanted, at Once—Foreman for a shop building heavy machine tools; must be up to date and a good manager of men. Box 351, AMERICAN MACHINIST.

Foreman wanted at once on light contract and typewriter work; wages about $4; state age, where worked and references. Address Universal Lock Co., Woodbine, N. J.

Wanted—A reliable person of mechanical or inventive mind to send to Paris Exposition; good salary and expenses paid. Address The Patent Record, Baltimore, Md.

Leading draftsman wanted on small instrument work; must be experienced; position permanent. Address, stating experience and salary, Box 347, AMERICAN MACHINIST.

Wanted—Foundry foreman, experienced particularly on small work, such as valves and fittings; state age, experience and wages expected. Address Box 348, AMER. MACH.

Machinists wanted; a number of first-class men on high-speed marine engine work. Apply Gas Engine & Power Co. and Charles L. Seabury & Co., Consolidated, Morris Heights, New York City.

Wanted—Experienced draftsman to work on cotton machinery; good position for an A1 man; state experience, references and salary expected. Address Box 317, AMERICAN MACHINIST.

Wanted—A foreman pattern maker familiar with gear making and loam work and able to do the necessary drafting connected with the pattern shop. Address P. O. Box 146, Albany, N. Y.

(*Continued on page 40.*)

DRAUGHTSMEN WANTED on Mill Machinery and Machine Tools.

APPLY TO

BETHLEHEM STEEL COMPANY,
South Bethlehem, Pa.

SAVED $250 BY AN INVESTMENT OF **$15.**

One large concern writes us that in three years it has saved **$250** on its oil bills through the use of a

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Largest Manufacturers of Oil Filters in the World.

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W. R. SAWYER, Lessee.
86 Seneca Street,
CLEVELAND, OHIO.
Gear Wheels and Gear Cutting
Of all descriptions.
Get Our Prices.

(*Continued from page 38.*)

was shaken out by the roll of the ship in the first sea encountered, and the guiding-rods and piston wobbled unsteadily and steam escaped in such quantities that it was found necessary to stop the engines in order to keep steam enough in the cylinders to control the boat's course."

Personal.

Mr. E. E. Minard has taken the position of foreman of the tool room in the stamping department of the Cleveland Machine Screw Company, Cleveland, O.

Those who are interested in and who may wish to know more of the shops of The National Cash Register Company, of Dayton, Ohio, should ask them to send a recently issued pamphlet entitled "A New Era in Manufacturing." Besides being a beautiful example of the printer's art, this book tells by picture and text a remarkably interesting story of a manufacturing business and a factory operated by entirely original methods—a story which ought to be far more interesting to a manufacturer or to anyone who works in a shop or factory than any other story ever written. In the early part of 1897 we gave in three numbers an account of this remarkable institution. Since that time it has gone on upon the lines then indicated—has developed still other strikingly original features, until it constitutes to-day one of the sights of the country that no one should miss an opportunity of seeing.

The Berlin Iron Bridge Company has the contract to design and build the building for the machinery annex for the American Commission at the Paris Exposition. The building will be designed to represent a typical American machine shop.

"Dreadful thing happened in my stable this morning." "What was it?" "My automobile got at the gasoline tank and foundered itself."—"Chicago Record."

Manufacturers.

The Owosso (Mich.) Carriage Company is arranging to build a brick factory at an estimated cost of $50,000.

Ground has been broken for the new factory that will be built by Pass & Seymour in West Solvay, N. Y. One building will be 176 by 60 feet and the other 100 by 40 feet.

E. W. Bliss Company has recently changed its Western office from 96 West Washington street to 22-24-26 South Canal street, Chicago, Ill., with Mr. W. S. Smith in charge.

The Westinghouse Machine Company will build a steel foundry and steel forging plant at East Pittsburgh that will cost $1,250,000 and have a capacity of 80 tons of steel castings and forgings a day.

Contractor Charles McCaul, 10 North Eleventh street, Philadelphia, Pa., has been awarded the contract for the Union Traction Company power-house building. This will be brick and iron and cost $15,000.

The Continental Iron Company, operating rolling mills at Wheatland and Girard, Pa., will at once begin the erection of fifty by-product coke ovens at Wheatland, which will give employment to a large force of men.

The works of the West Coxsackie Iron Foundry, West Coxsackie, N. Y., were recently destroyed by fire. It is the intention to rebuild at once, and it is expected the plant will be in running order in about sixty days.

William Steele & Son have taken revised estimates for the two-story brick and iron storage and factory building, to be erected for Peter Woll & Co., adjoining their present office, at Mascher and Berks streets, Philadelphia, Pa.

Henderson & Co., Heed Building, Philadelphia, Pa., have the contract for the plate-bending shop to be erected at League Island Navy Yard. It will cost $70,800, and will be brick and iron. This work is to be started immediately.

The Carnegie Steel Company will immediately commence the construction of two blast furnaces, each of which will have a capacity of 7,000 tons per week. These furnaces will be built on the Carnegie Carrie Furnace property at Rankin Station.

Architect Louis Kamper is preparing plans for a foundry for the Detroit (Mich.) Stove Works, to be erected in connection with their plant at the southwest corner of Jefferson and Canton avenues, that city. It will be 136 by 100 feet in size, of extra heavy frame construction.

Northern Engineering Works, Detroit, Mich., crane manufacturers, are adding an addition to the plant recently purchased by them. The interior arrangement of the machine shop and office is also being remodeled, with a view to enlarging the capacity of the plant.

Macey, Henderson & Co., Philadelphia, Pa., have been awarded a contract for a brick and iron machine shop at Ellen and Front streets for a local company. It will be two stories and will be of iron framework, with slag roofing, cement flooring, iron grille work, piping and drainage, electric wiring, etc.

The Berlin Iron Bridge Company, of East Berlin, Conn., is shipping to Mexico the structural iron material for the roof of a building 80 feet wide and 255 feet long. This roof is to be erected on masonry walls, and the building is to be used for a paper mill for the San Rafael Paper Company, City of Mexico.

The J. G. Wagner Company, Milwaukee, Wis., has purchased a tract, 200x346 feet, adjoining its plant, and upon it will erect a foundry with a capacity of 30 tons of castings per day. The foundry will cost about $60,000 and will give employment to 180 men. The company will also make some extensions to its structural-iron department.

The New Era Iron Works Company, of Dayton, Ohio, manufacturers of "New Era" gas and gasoline engines, has recently purchased a new plant, which it is now remodeling and equipping with all the latest improved machinery. The demand for its engines has been such as to compel this action, and by January 1 its capacity will be doubled.

Plans for the construction of an iron foundry adjoining their main plant, have been accepted by P. H. Skidmore & Sons, proprietors of the Pacific Iron Works, Bridgeport, Conn. Philo H. Skidmore, Jr., said a few days ago that the foundry would be built just as soon as the necessary structural iron could be obtained. It will have a capacity equal to that of the foundry now in use.

The Diamond Stone Working Company, of Burnley, England, is seeking location for a plant in Fall River, Mass., and J. H. Hadfield has in hand a subscription stock list for a new corporation to purchase its facilities

(*Continued on page* 41.)

Help Wanted—Continued.

Wanted—In our automatic screw-machine department of 18 machines, one working second hand and one operator on the Hartford and Cleveland machines. McKay Metallic Fast. Assn., Winchester, Mass.

Wanted—Machinist foreman for college shops; foundry experience desirable; 400 students, 30 apprentices; machinery and scientific apparatus built; salary $900 per year. Address Mechanical Dept., Kansas State College, Manhattan, Kansas.

We are enlarging our works, and will shortly require an increased number of skilled mechanics; we invite applications from draftsmen, pattern makers, molders and machinists. Address the Westinghouse Machine Company, East Pittsburgh, Pa.

Wanted—Superintendent, capable and energetic man, thoroughly experienced in factory practice; knowledge of the principles of electricity desirable, but not essential. Address "Manufacturer," care AMERICAN MACHINIST, stating experience, age, references and salary expected.

Wanted—By city manufacturing company, a practical mechanical engineer and draftsman; preference given to those having had experience with steam engines, dredging and all kinds of general machinery. Write, stating age, nationality, with full particulars covering experience and references, Box 349, AMERICAN MACHINIST.

Wanted—In big city in England, works foreman or superintendent experienced in gas-engine work; splendid opening for good, energetic, experienced man; must be able to originate a system of gages, jigs and special tools and efficiently control about 80 hands; salary £3 10s. per week and commission. Address Box 346, AMERICAN MACHINIST.

J. M. ALLEN, President.
WM. B. FRANKLIN, Vice-President.
P. B. ALLEN, Second Vice-President.
J. B. PIERCE, Secretary.
L. B. BRAINERD, Treasurer.
L. F. MIDDLEBROOK, Assistant Secretary.

RUSSIA.

A well-known, energetic merchant (Christian), having a practical technical education, and who has traveled extensively throughout Russia, desires to represent some large machine tool company or manufacturers of special machinery. He wishes to carry a line of such machinery in stock, and agrees also to travel. Can refer to American Consul. For further particulars address,

Box 270, American Machinist.

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THE ELECTRICAL ENGINEER INSTITUTE OF CORRESPONDENCE INSTRUCTION,
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I consider the Electrical Engineer Institute conducted by Messrs Wilson and Maxim to be of great benefit to those who desire an electrical education.
Thomas A. Edison

He Won't Build It for You.

The special machine you want varies from the manufacturer's standard design. He won't build it for you at a price you can afford to pay. It's too much trouble.

But it's just the kind of trouble we are looking for. We don't mind it, it's our special business, and because of special facilities we can do it in the right way—giving our best engineering skill to producing what you want at a reasonable cost.

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Engineer and Machinist,
109-115 No. 22d St., - Philadelphia, Pa.

A Valuable Volume.

Everyone who is in any way interested in Mechanics will find it to their advantage to immediately procure the new book entitled,

MECHANICAL MOVEMENTS,

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It fully illustrates the leading devices for the transmission of power and its measurement. It exhaustively describes every known motive power in the world, deals with the principles of construction in electrical appliances, treats of the horseless carriage and bicycle movements, minutely describes every known kind of machine, both large and small, gives their various uses and method of construction, and, in short, presents a copious dissertation on mechanics, powers, devices and appliances.

It is a book which every machinist, inventor, student, mechanic, draughtsman, engineer, electrician, and everybody interested in the devising and operation of mechanical works, should have in his possession. As a handy book of reference it is without a peer.

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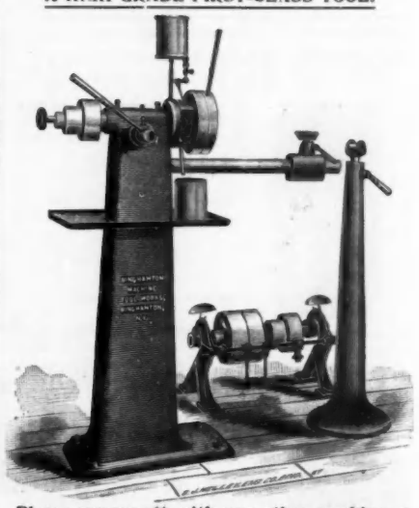

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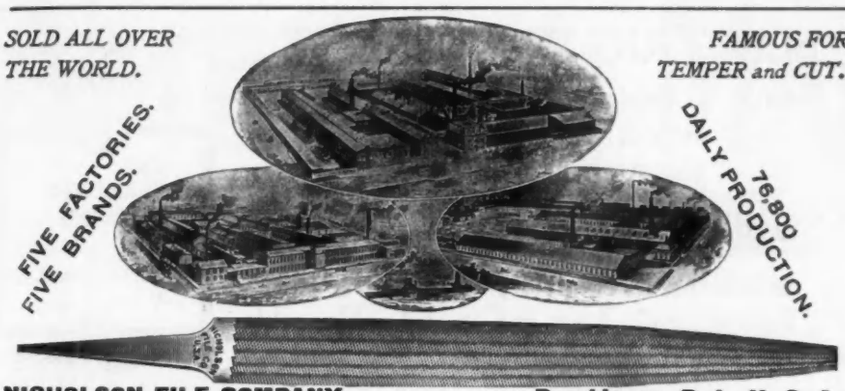

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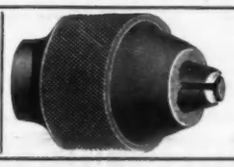

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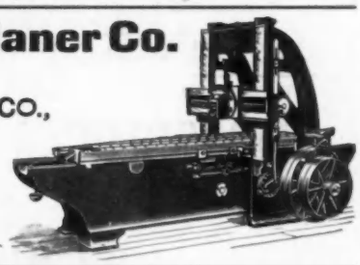

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(*Continued from page* 40.)

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New Catalogs.

The J. D. Smith Foundry Supply Company, Cincinnati, Ohio, sends us small catalog and price list of castings, foundry supplies, etc.

Baldwin Locomotive Works, Philadelphia, Pa., send us No. 15 of "Record of Recent Construction," containing information regarding a variety of locomotives and for a variety of kinds of service. The catalog is standard size, 6x9 inches.

Chambers Brothers Company, of Philadelphia, sends us catalog No. 15 devoted to the illustration and description of brick machinery. The variety of machines is quite large, and to those interested the catalog should prove of great value. It is 7x10 inches.

J. Geo. Leyner, Denver, Colo., sends us copy of catalog "A" of air compressors, rock drills, coal cutters and other pneumatic machinery. The machines are described very fully. There are a number of testimonial letters from users. The catalog is standard size, 6x9 inches.

We have received from the educational department of the Hillyer Institute of the Young Men's Christian Association in Hartford, Conn., copy of catalog in which is given full information concerning the evening classes to be held in connection with the institution referred to.

We are in receipt of catalog of the Safety Emery Wheel Company, of Springfield, Ohio, in which are illustrated emery wheels of various styles and sizes, together with a full line of grinding and polishing machinery. The catalog contains 80 pages and is standard size, 6x9 inches.

The American Locomotive Sander Company, Philadelphia, Pa., has sent us catalog illustrating and describing the various devices used for sanding rails. Sketches showing the construction and methods of connecting them to locomotives are presented. The catalog is 6x9¼ inches.

A new bulletin is just issued by the Bullock Electric Manufacturing Company, of Cincinnati, Ohio, and describes type "N" motors. This is the first bulletin of the standard 6x9-inch size which has been issued, and it is believed those interested in electrical literature will appreciate this reduction in size, as it is more readily filed than the larger pamphlets. It may be had by addressing the company.

We have received from the Springfield Engine Stop Company, Springfield, Mass., copy of catalog which contains illustrations and description of the Corliss and Columbia electric engine stops and speed limits. The principal feature of these devices is gone into carefully, and illustrations showing the applications of it to steam engines are given. There is also a list of users. The catalog is 5½x8¼ inches.

Robert Wetherell & Co., Chester, Pa., have sent us catalog in which is illustrated and described the Berry safety boiler. These boilers are built in units ranging from 50 to 250 horse-power. The various points of merit in them are described in detail. The catalog contains some useful information regarding superheated steam, which should interest steam users generally. This information is taken from reports of experiments conducted on some of the vessels of the navy. The catalog is standard size, 6x9 inches.

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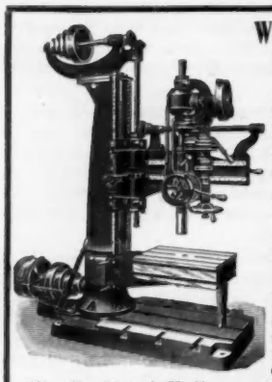

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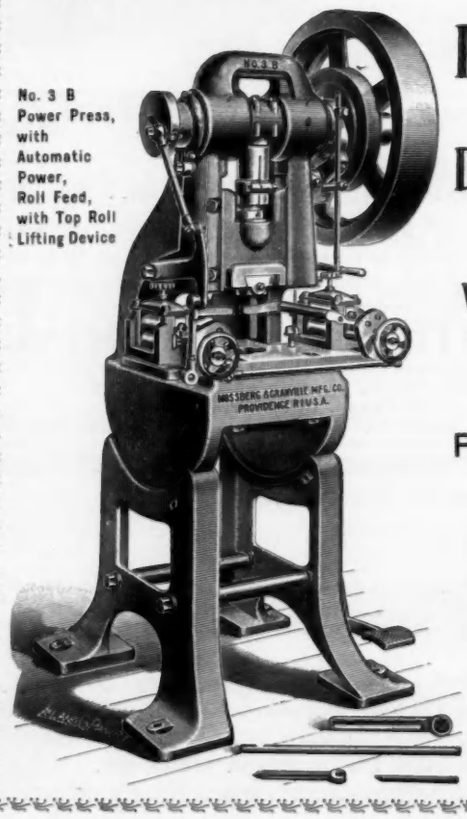

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